NOLOGY DEPT.

In this issue - - - -
Special Petrochemical Report

L AND GAS URNAL

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NOV 4 1950
DETROIT

Hughes Flash-Weld your best buy in tool joints!

Probably no coupling in industrial use takes the terrific beating that the joints of a drill stem undergo. During rotation, they are constantly twisted, flexed and pulled by the heavy weight of the stem and collars, and ground by gritty mud and abrasive sands.... It's no wonder joints need to be strong and enduring. Failure of *one* joint in a stem at any depth is costly!

Failure of a Flash-Weld joint in field operation is almost unknown! The Flash-Weld Tool Joint, a development of Hughes Tool Company, entirely eliminates the threaded pipe connection—the cause of nearly all drill-stem failures.

Any Hughes field man will tell you more about the construction and value of Flash-Weld joints. A string of Flash-Weld Tool Joints is the most enduring, most economical buy you can make in drill stem. Talk to a contractor who runs them!

PRICE 50 CENTS TABLE OF CONTENTS PAGE 25 NOVEMBER 2, 1950

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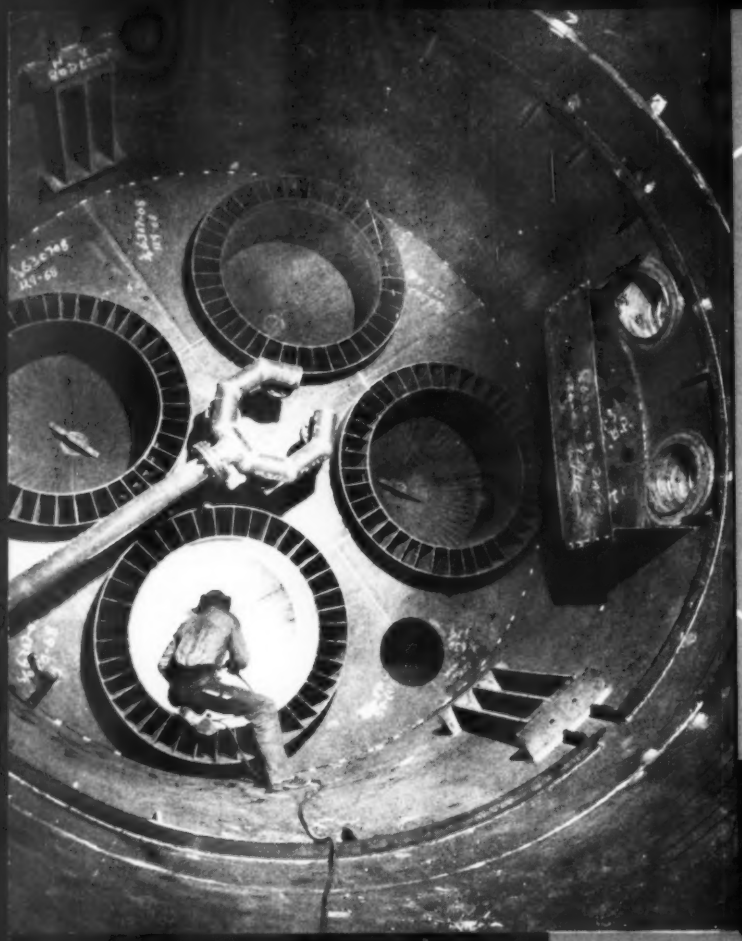

Putting clock-like precision in vessels weighed in hundreds of tons

More than a third of a century fabricating fine products for industry from plate steel

Wyatt's

HOUSTON-DALLAS-NEW YORK-TULSA

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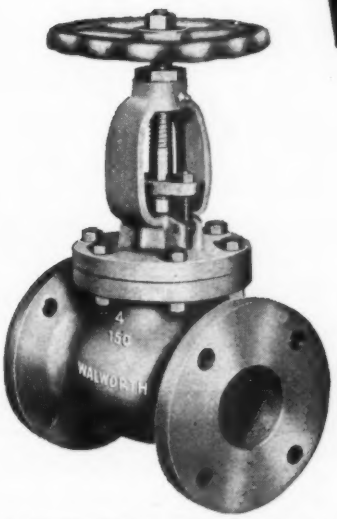
R v.49 Nov.-Dec. 1950

Newly Designed Walworth Valves to combat corrosion

Walworth 150-pound Stainless Steel Gate Valve . . . available in sizes ½ to 3-inch, screwed; ½ to 12-inch, flanged.

Made of Stainless Steel
Monel · Nickel
Acid-resisting Bronze
Ni-resist



Walworth 150-pound Stainless Steel Globe Valve . . . available in sizes ½ to 3-inch, screwed; ½ to 6-inch, flanged.

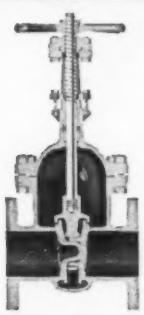
— ENGINEERED AND TESTED FOR TOUGH . . . HARD SERVICE

Walworth offers a comprehensive line of valves made of several cast stainless steels and special alloys for piping services where corrosion is a factor. These valves are available in Gate, Globe, Angle, Check, and Lubricated Plug types.

Gate, Globe and Angle Valves have outside screw and yoke construction, thus keeping the stem threads out of contact with the corrosive material in the line. They also have a two-piece bolted gland with ball-type gland follower to prevent binding the stem when packing bolts are tightened. Gland eye-bolts can be conveniently swung out of the way without danger of loss when the gland is lifted for repacking.

Gate Valves have taper seats with a unit consisting of two flat faced discs supported by a carrier on the end of the stem. The discs are of a proven ball-and-socket type. They are free to rotate and adjust themselves to the body seat angles, assuring tight seating with no possibility of sticking in any position.

For further information about Walworth's full line of corrosion-resistant valves, see your Walworth distributor.



Sectional view of Walworth 300-pound Stainless Steel Gate Valve . . . available in sizes 2 to 6-inch, flanged.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Tech.

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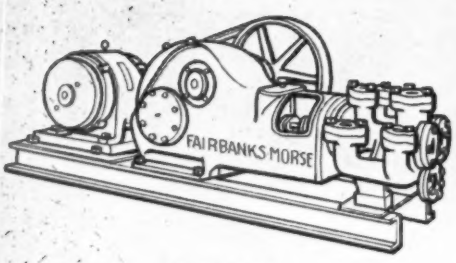
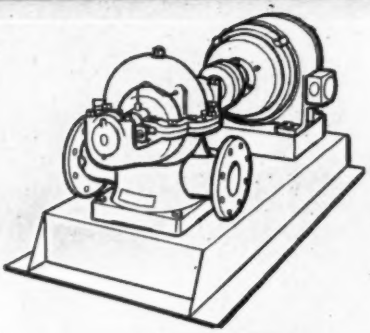
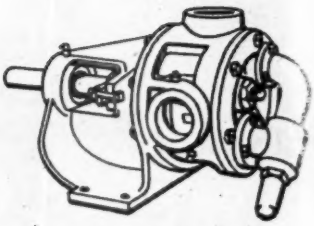


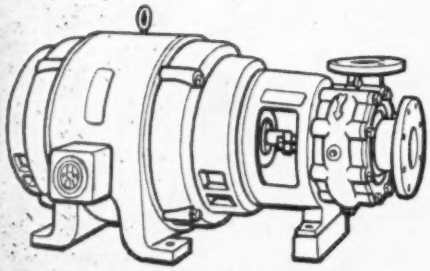
Power Pumps



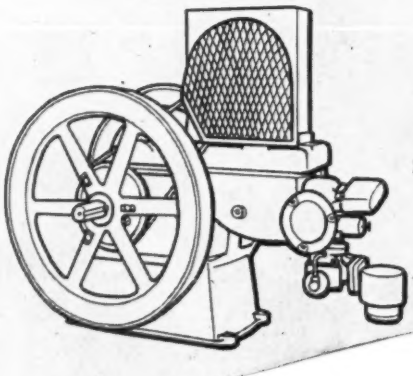
Centrifugal Pumps



Rotary Pumps



Builtogether Pumps



ZC Engines

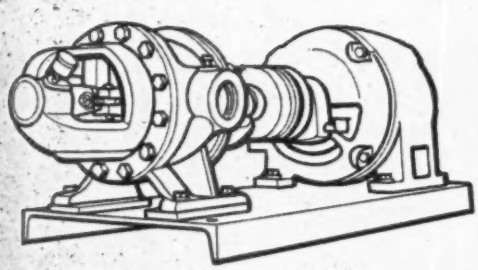
Designed for Dependability

Fairbanks-Morse Oil Field Equipment

FAIRBANKS-MORSE

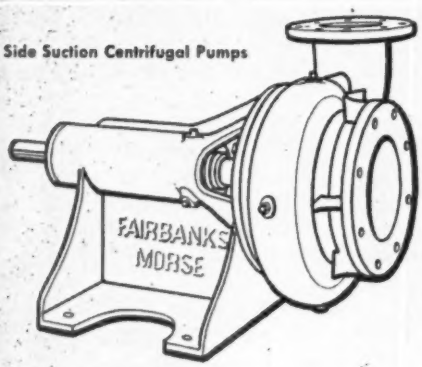
A name worth remembering

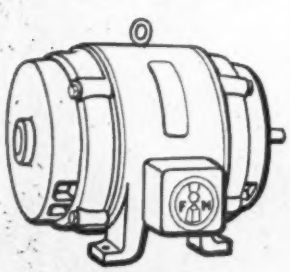
OIL FIELD EQUIPMENT • DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS



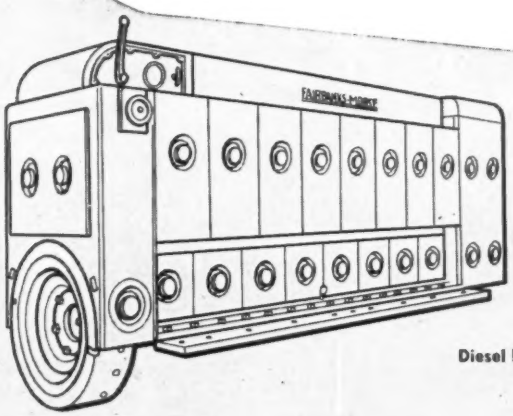
Westco Pumps

Side Suction Centrifugal Pumps





Electric Motors



Diesel Engines

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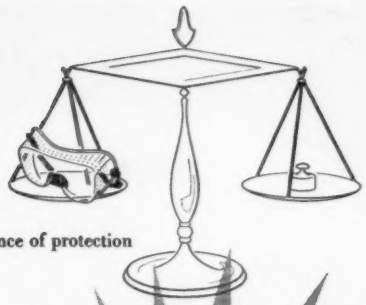
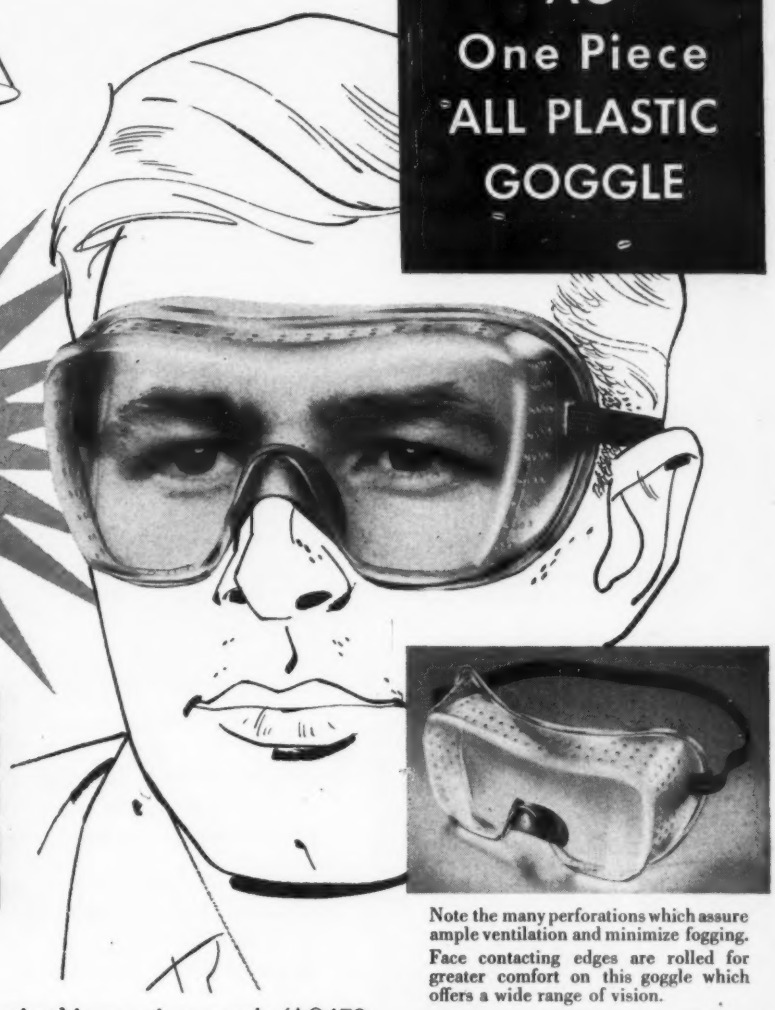


One ounce of protection

AO One Piece ALL PLASTIC GOGGLE

AO's NEW INEXPENSIVE ALL PLASTIC GOGGLE



- LIGHTWEIGHT
- NON-FOGGING
- WELL-VENTILATED
- NON-FLAMMABLE
- WELL-FITTING

Note the many perforations which assure ample ventilation and minimize fogging. Face contacting edges are rolled for greater comfort on this goggle which offers a wide range of vision.

Goggle fits comfortably over most personal glasses with nosepiece hugging nose snugly.

Made of impact resisting plastic, this one-piece goggle (AO479 Clear, AO480 Green) is "optically correct" and meets government specifications. It affords exceptional wide angle vision and can be worn over most standard types of personal glasses and most prescription spectacles and goggles. Recommended for protection against foreign particles striking from any direction on the following types of work: babbiting, chipping, cutting rivets, grinding, hand-tool operations, machine operations, spike driving and similar operations. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS
479-480 GOGGLE

- One size only but designed to fit all faces comfortably
- Elastic headband, easily adjusted
- 4 point contact to face of wearer, resists rocking
- Plastic nosepiece fits all noses comfortably and snugly
- Rolled edges for comfort, better fit in contacting face
- Order by number 479 Clear
- Order by number 480 Green

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1950.

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THIS ScrubTeam BEAT THE FUME AND DUST MENACE

The four 48" SK Fume Scrubbers in the top view are used for absorption of sulphurous fumes in an oil refinery.

The two 6" SK Fume Scrubbers in the lower photo are made of Haveg and handle hydrochloric acid vapors at the plant of a large producer of synthetic materials.

OBNOXIOUS, contaminating fumes and vapors—heavy, corrosive and dangerous dusts—*need not* create a major plant problem, *can* be effectively and economically controlled.

To meet and master varying conditions in the battle against this menace, SK manufactures a wide range of types and sizes of Vapor Condensers or Fume Scrubbers—a team specially designed for such service.

If your conditions are such that fumes or dust can be knocked down and scrubbed with water or other liquid, an SK Fume Scrubber can do the job economically. Simple in construction, these units produce their own draft and give complete mixing without possibility of by-pass.

Standard and Special Fume Scrubbers are available in various materials such as cast iron, welded steel plate, Haveg, stoneware, hard lead and other corrosion resistant alloys or chemical resistant linings. Rubber lining is available with cast iron or welded steel plate.

For complete information, write for Bulletin 4-R. If your problem is immediate, call or teletype.

SCHUTTE and KOERTING Company

Manufacturing Engineers

1175 THOMPSON ST. • PHILADELPHIA 22, PA. • TWX No.: PH 782

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS • FLOW INDICATORS • RADIAFIN TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS

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a Jewel...

for Pipeline Operators

One of Webster's definitions of a jewel is "an object of special affection".

That's the way more and more pipeline operators regard the Clark Centrifugal Compressor. Here's why:

- ***Proved Performance***—The original single-seal pipeline booster that has been proved by two years' full load field service operation.
- ***Compact***—Integral oil reservoir and direct-driven pump save station floor space.
- ***Rugged***—Proved by maximum availability and total freedom from mechanical failure. Impeller and bearing assembly and support of sound proven design insure this Clark plus value.
- ***Easy to Install***—Built-in oil pump and reservoir reduce field erection labor.
- ***Quiet***—Operates with hardly a whisper.
- ***Trouble-free***—Has required practically no maintenance.
- ***Versatile***—Radical modifications of flow and pressure characteristics have been accommodated at minimum expense. Clark foresight in providing interchangeable integral guide vanes and tapered fit for impeller hub provides this plus advantage.
- ***Sealing***—The original and most efficient-high pressure oil film seal with characteristic freedom from metal or surface rubbing contact insures maximum life and guarantees against seal failure without warning.

Why take chances with mechanical modifications when Clark has the proved trouble-free answer? Call your nearest Clark office, or write for descriptive booklet.

SEE the difference in

CLARK COMPRESSORS

ONE OF THE DRESSER INDUSTRIES

MIDGET ANGLE · RIGHT ANGLE · BIG ANGLE · ELECTRIC-DRIVEN · CENTRIFUGAL

New York • Tulsa • Houston • Chicago • Boston • Washington • Los Angeles • Birmingham • Detroit • Salt Lake City • San Francisco
London • Buenos Aires • Caracas, Venezuela • Paris • Bucharest, Rumania • Lima, Peru • Bogota, Colombia • New Delhi, India

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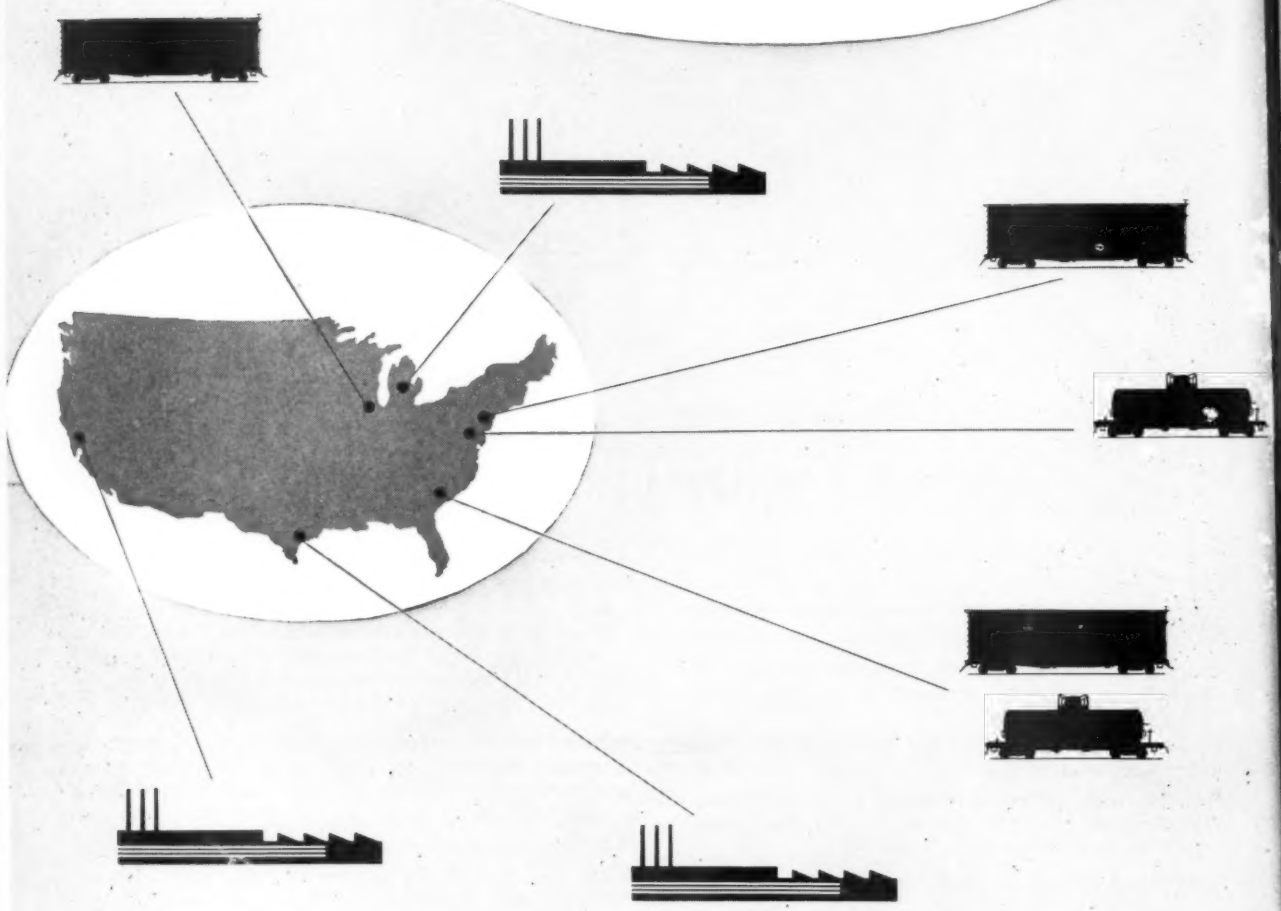
Dow Caustic Soda

serves industry

. . . with unequalled distributing facilities

1. Three producing plants—in Michigan, Texas and California.
2. Caustic Soda Solution bulk tank terminal distributing facilities—Carteret, N. J. and Charleston, S. C.
3. Caustic Soda Solid, Flake and Ground Flake terminal distributing facilities—Chicago, Ill., Charleston, S. C., and Port Newark, N. J.



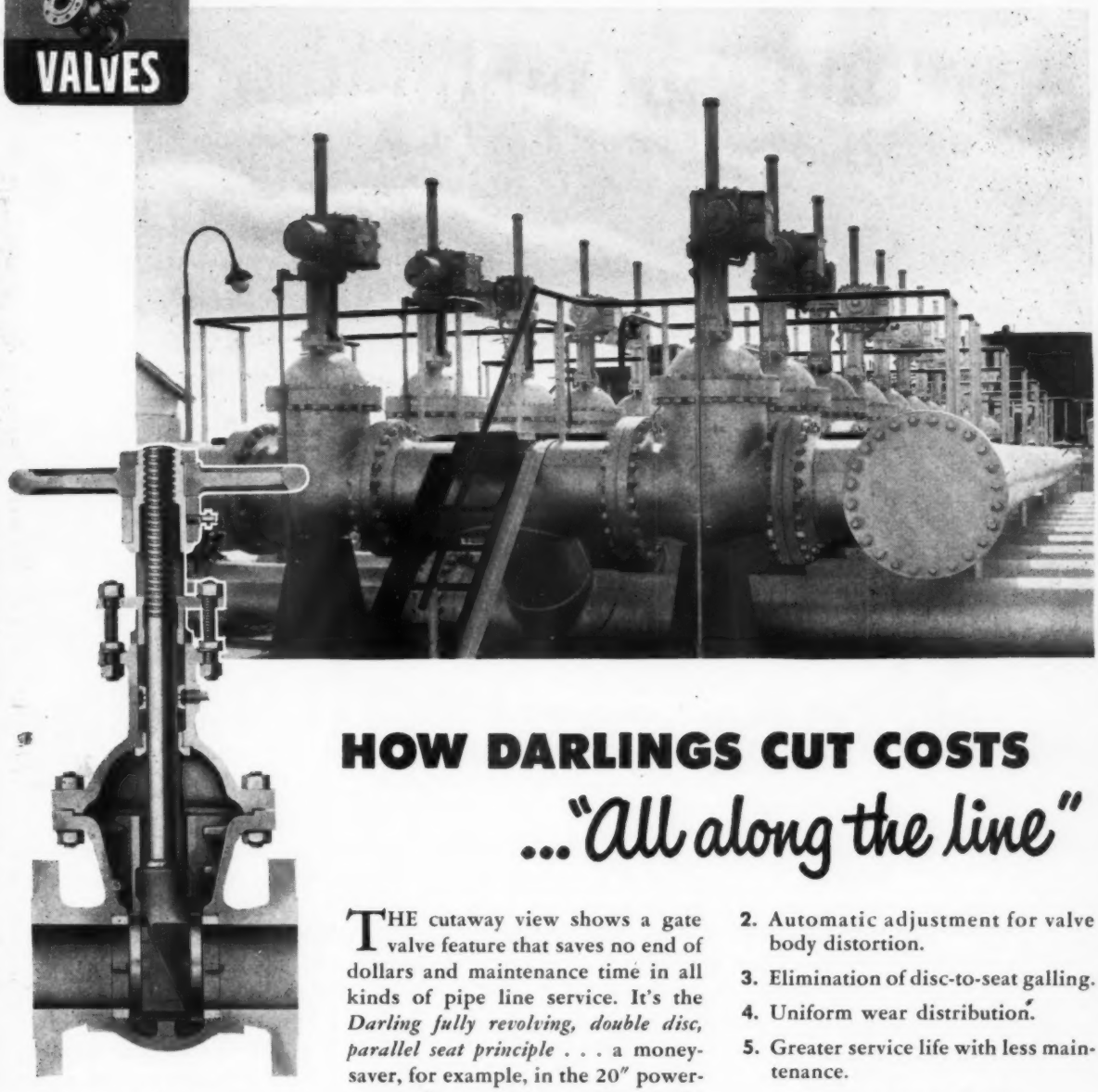
THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

DARLING VALVES

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN



Cutaway view of Darling cast steel gate valve shows complete simplicity of the fully revolving, double disc, parallel seat principle . . . just four simple working parts . . . two interchangeable, no-pocket discs and two husky wedges. Maintenance is minimized and extremely easy . . . assembly foolproof. And as to all-around behavior . . . it's a perfect natural for pipe line service! Darling pipe line gate valves have full seat opening, same as I.D. of pipe, allowing free passage of line scrapers.

HOW DARLINGS CUT COSTS ...*"All along the line"*

THE cutaway view shows a gate valve feature that saves no end of dollars and maintenance time in all kinds of pipe line service. It's the *Darling fully revolving, double disc, parallel seat principle* . . . a money-saver, for example, in the 20″ power-operated cast steel gate valves in the pipe line manifold installation pictured here.

On line after line this unique Darling feature proves its time-and-money-saving value because it cinches such important advantages as . . .

1. Positive, easy, tight closing.
2. Automatic adjustment for valve body distortion.
3. Elimination of disc-to-seat galling.
4. Uniform wear distribution.
5. Greater service life with less maintenance.

SEND FOR DATA

If you don't have *all* the facts on Darling gate valves of this type, it will pay you to look into them. Darling parallel seat gate valves come in a wide range of sizes and constructions for *all* gas and oil line requirements. Simply outline your particular service needs or ask for complete descriptive bulletin.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

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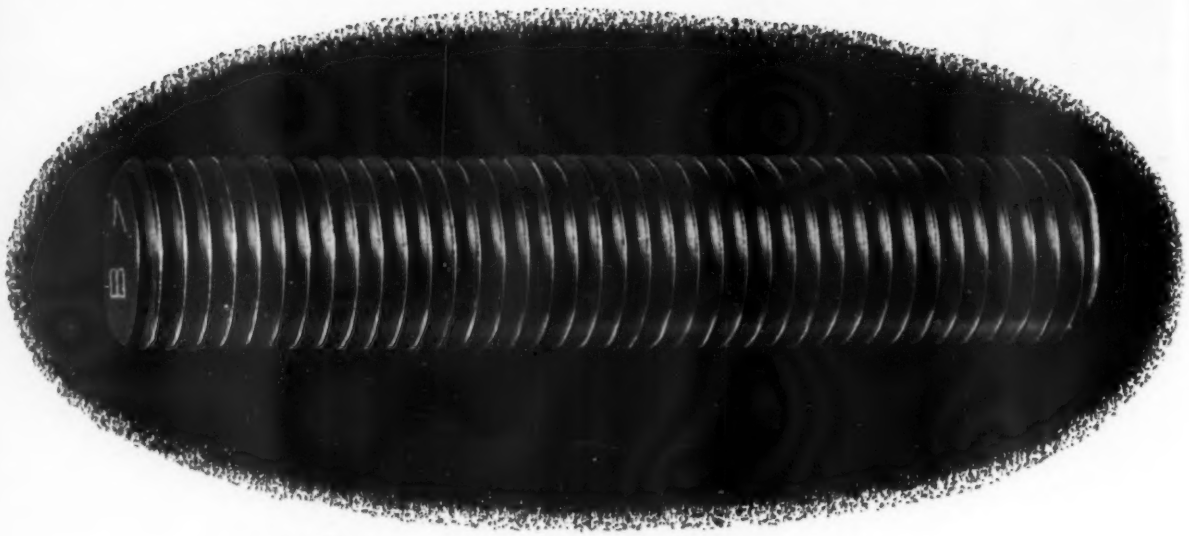

Minimizes Stress concentrations

Regardless of the high temperatures and high pressures encountered in refinery bolting jobs, you can be sure of reliable performance when you use the Bethlehem Continuous-Thread Stud.

This is because the Bethlehem Continuous-Thread Stud does such an effective job of minimizing stress concentrations. The stud has no point of thread runout. Consequently, when stresses do occur, they can't concentrate at any one point — instead they are effectively distributed over the entire working length of the stud.

The Bethlehem Continuous-Thread Stud is made from carbon or alloy steels, and comes either plain or heat-treated. It is furnished in a wide range of diameters and in any length, with most sizes carried in stock.

We'll be glad to answer your questions about the use and economy of the Bethlehem Continuous-Thread Stud. Put them up to the nearest Bethlehem sales office, or get in touch with us at Bethlehem, Pa.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Bethlehem supplies every type of Fastener

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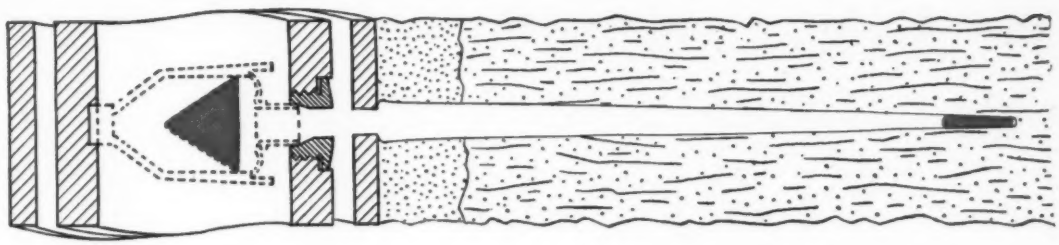
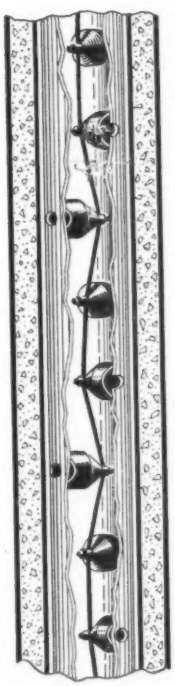
Formations Penetrated Up to Three Times Deeper



DEPENDABLE PERFORMANCE OF

Du Pont Jet Perforators

ASSURED BY QUALITY-CONTROLLED MANUFACTURE



Tremendous power and penetrating action of Du Pont Jet Perforators is produced by a shaped charge with conical copper liner within a molded plastic shell. Sketch shows spiral arrangement of Perforators in a carrier.

Du Pont Jet Perforators are precision-made, high-powered, shaped charges . . . another product of Du Pont Explosives Research. They're designed to perforate one, two or even three strings of oil-well casings *and* to penetrate far into formations . . . up to three times deeper than is possible by other methods.

To assure this dependable performance of Jet Perforators at all times, every exacting detail of their intricate manufacture is carefully controlled by laboratory technicians. Inspections are frequent. This attention to production procedure assures uniformity of action and predictable results of Jet Perforators in actual use.

Controlled quality of each Du Pont Jet Perforator also helps service companies to make *every* shot productive. Jet perforations are certain, clean-cut . . . and no burrs remain in casings. Penetrations extend completely through the area of mud damage so that flow channels are free and unobstructed. Rig time is cut in half since jets are pre-loaded in leak-proof containers . . . ready to lower into the well.

That is why—today—more and more operating companies are requesting that their service organizations utilize Du Pont Jet Perforators for maximum efficiency and production results on every job. An informative free bulletin tells how Du Pont Jet Perforators operate. Write for it—now. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

DU PONT

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

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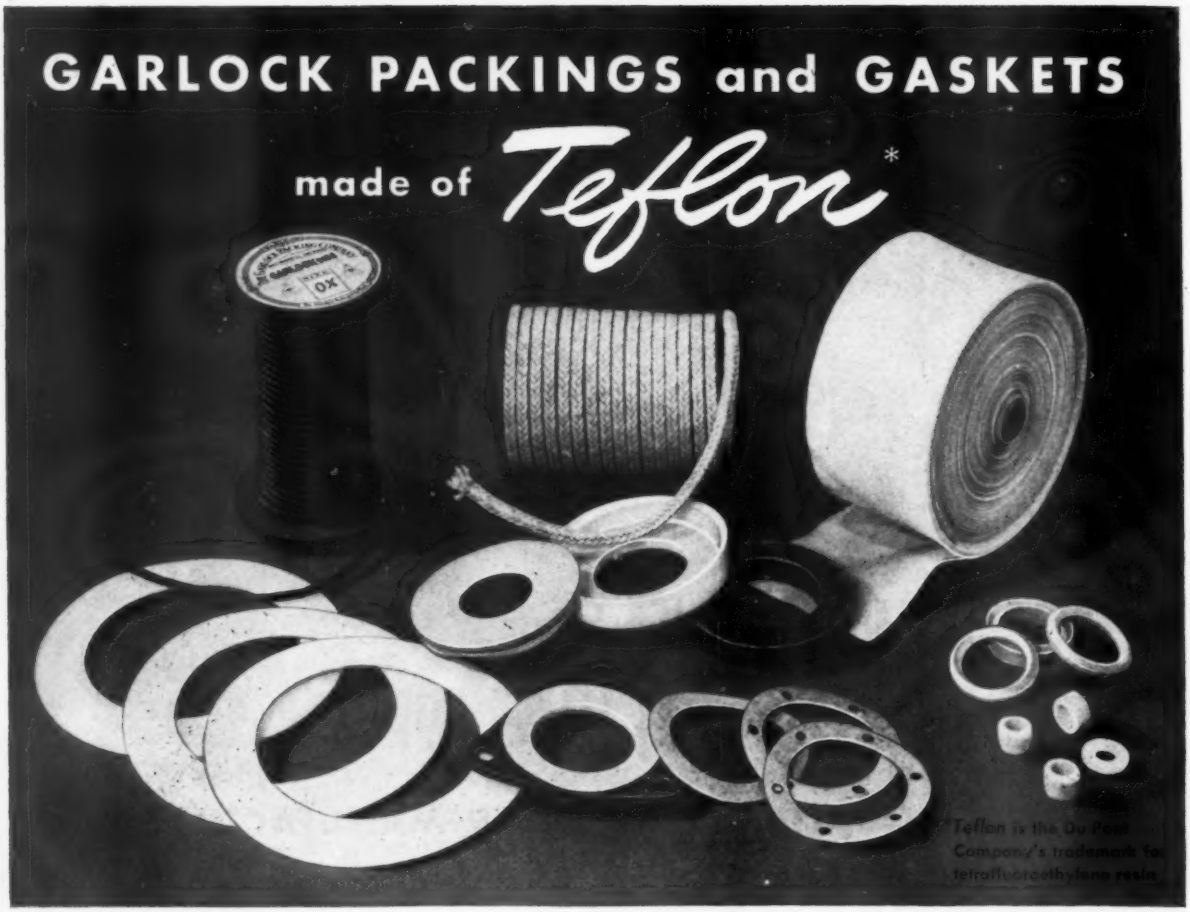
GARLOCK PACKINGS and GASKETS

made of *Teflon**



*Teflon is the Du Pont Company's trademark for tetrafluoroethylene resin

Extremely Inert to Chemicals; Heat Resistant; Tough; Durable

GARLOCK packings and gaskets made of *Teflon* solve the problem of sealing against acids and chemicals of all kinds.

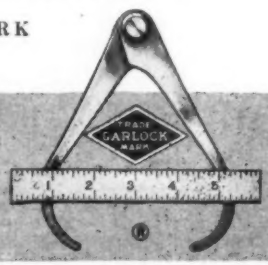
These *Teflon* products, fabricated in the GARLOCK factories, are unaffected by any acid and are highly resistant to all organic solvents and alkalies. They operate at temperatures from below −90° F. up to +500° F. and have high mechanical strength and a low coefficient of friction within that temperature range.

For use on valves, pump rods or shafts and any other equipment in the chemical industry, GARLOCK produces several types of braided and molded *Teflon* packings. For gasketing flanged joints of all kinds, including glass and porcelain flanges, *Teflon* envelope gaskets or solid *Teflon* gaskets are available in required sizes and shapes.

To avoid frequent shut-downs and reduce your packing costs, use GARLOCK packings and gaskets made of *Teflon* on all your equipment handling acids or chemicals. *Write for pamphlet.*

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Tulsa, Okla. Houston, Texas Los Angeles, Calif.



GARLOCK

First Step In A Money-Saving Plan

You'll find the fully hydraulic Bucyrus-Erie Hydrocrane the time and money saving answer to dozens of jobs around a refinery, such as:

1. **Handling material for refinery construction**
2. **Erecting new equipment during plant expansion**
3. **Setting heat exchangers, condensers, valves**
4. **Stockpiling and rehandling materials**
5. **Unloading bulk chemicals from freight cars**
6. **Digging footings, drainage ditches, etc.**
7. **Assisting on repair work, alterations — odd jobs around the plant**

One refinery has so many jobs for its Hydrocrane, it keeps the machine busy at least six hours a day — every day!

The Hydrocrane travels at truck speeds . . . gets around fast. Every operating function is fully hydraulic. Wide variety of attachments increases the machine's usefulness. Available with crane hook, hydraulically operated clamshell bucket, 3-tine or multi-tine grapple, trash bucket, magnet. Two sizes — ¼-yd. 2-ton; ⅜-yd. 3-ton. Send the coupon for further details.

Bucyrus-Erie Hydrocrane Division
South Milwaukee, Wisconsin

BUCYRUS-ERIE HYDROCRANE DIVISION
South Milwaukee, Wisconsin 89H50

Gentlemen: I want more information on the time- and money-saving possibilities of the Hydrocrane.

Name.....

Company.....

Address.....

City..... State.....

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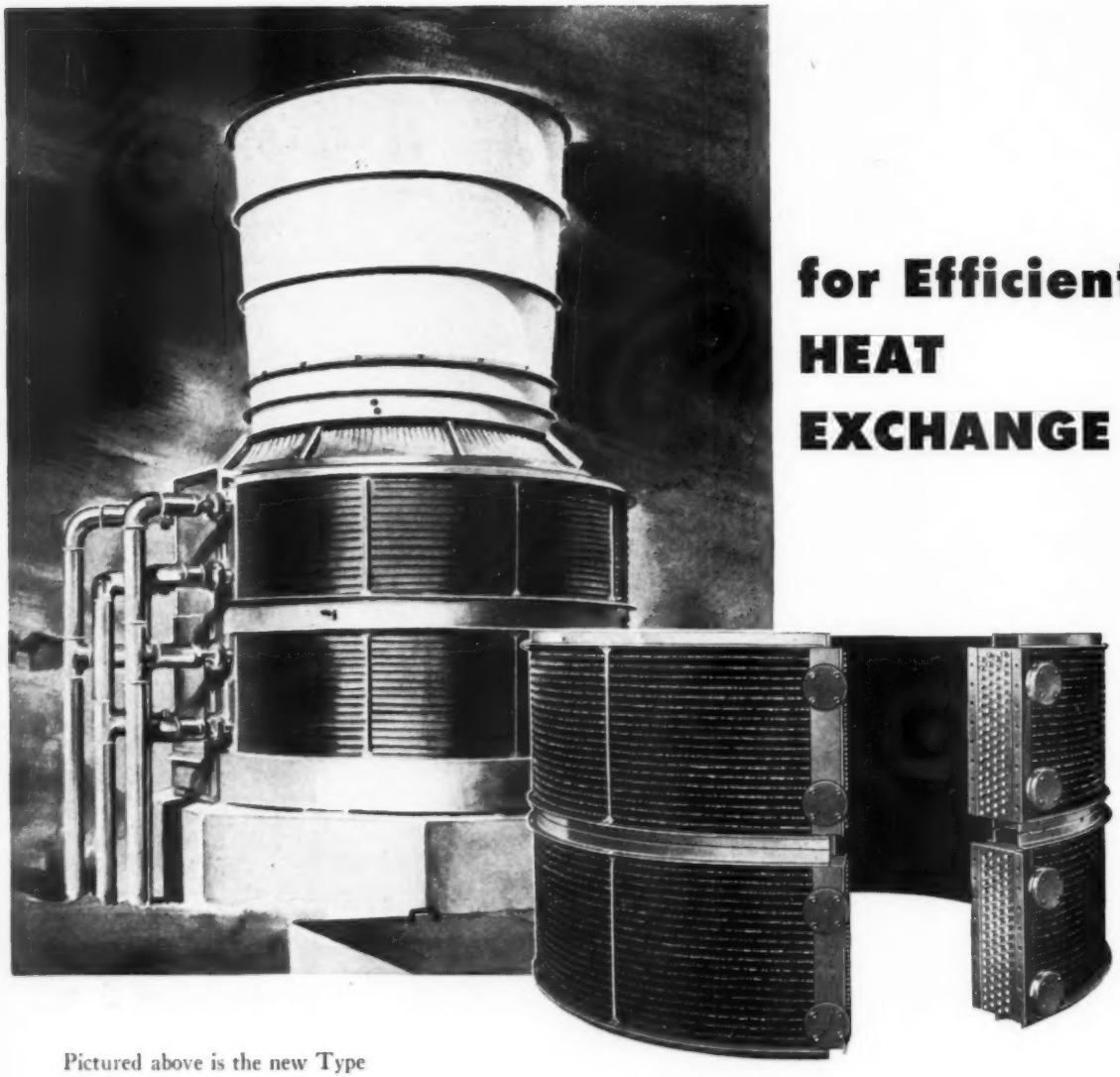


for Efficient HEAT EXCHANGE

Pictured above is the new Type "E" QUINTAIR *Air Cooled Heat Exchanger,* designed, engineered and manufactured by J. F. Pritchard & Co.'s Equipment Division. Curved Aerofin sections *(see illustration at right)* enable this unit to take maximum advantage of winds from any direction. Especially suited for engine and compressor jacket water cooling.

...Always Specify AEROFIN

Regardless of the heat-exchange application — or the operating conditions which prevail . . . regardless of the type of atmosphere or liquid, Aerofin will supply the design and materials best suited to the job.

Aerofin's unequalled experience, research and manufacturing facilities in the heat-exchange field are your assurance of greatest efficiency and longest service life.

AEROFIN CORPORATION

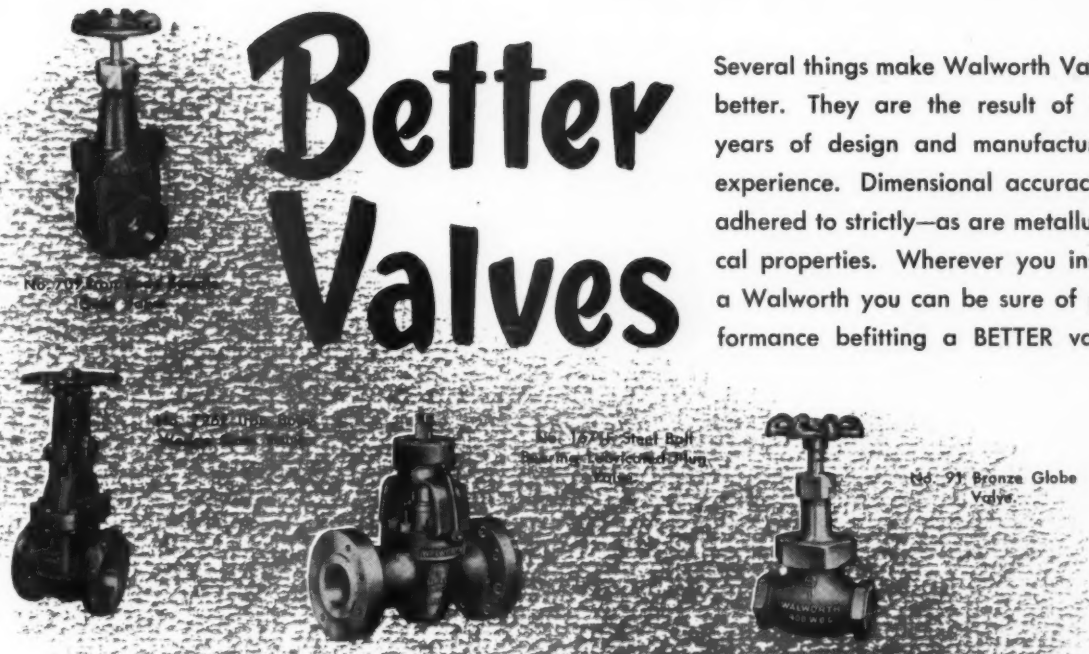
410 South Geddes St., SYRACUSE, N. Y.

NEW YORK • CHICAGO • CLEVELAND • DETROIT • PHILADELPHIA • DALLAS • SAN FRANCISCO • TORONTO • MONTREAL

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

Better Valves

Several things make Walworth Valves better. They are the result of 108 years of design and manufacturing experience. Dimensional accuracy is adhered to strictly—as are metallurgical properties. Wherever you install a Walworth you can be sure of performance befitting a BETTER valve.



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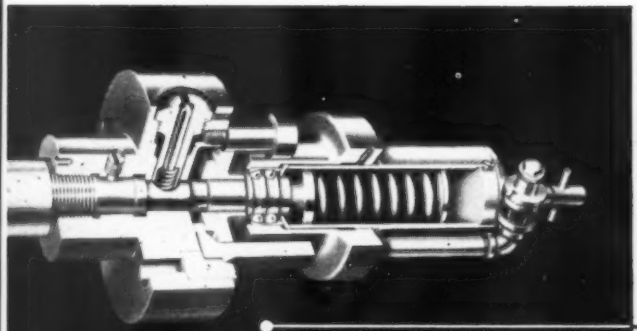

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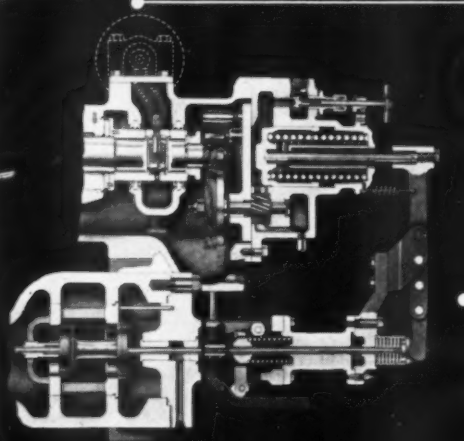

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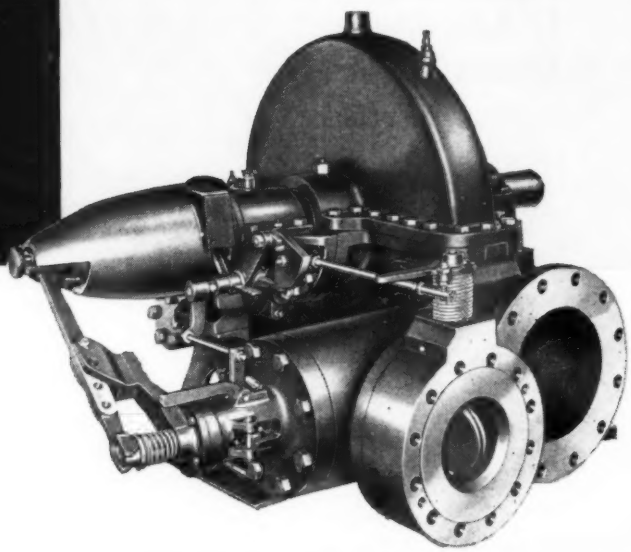

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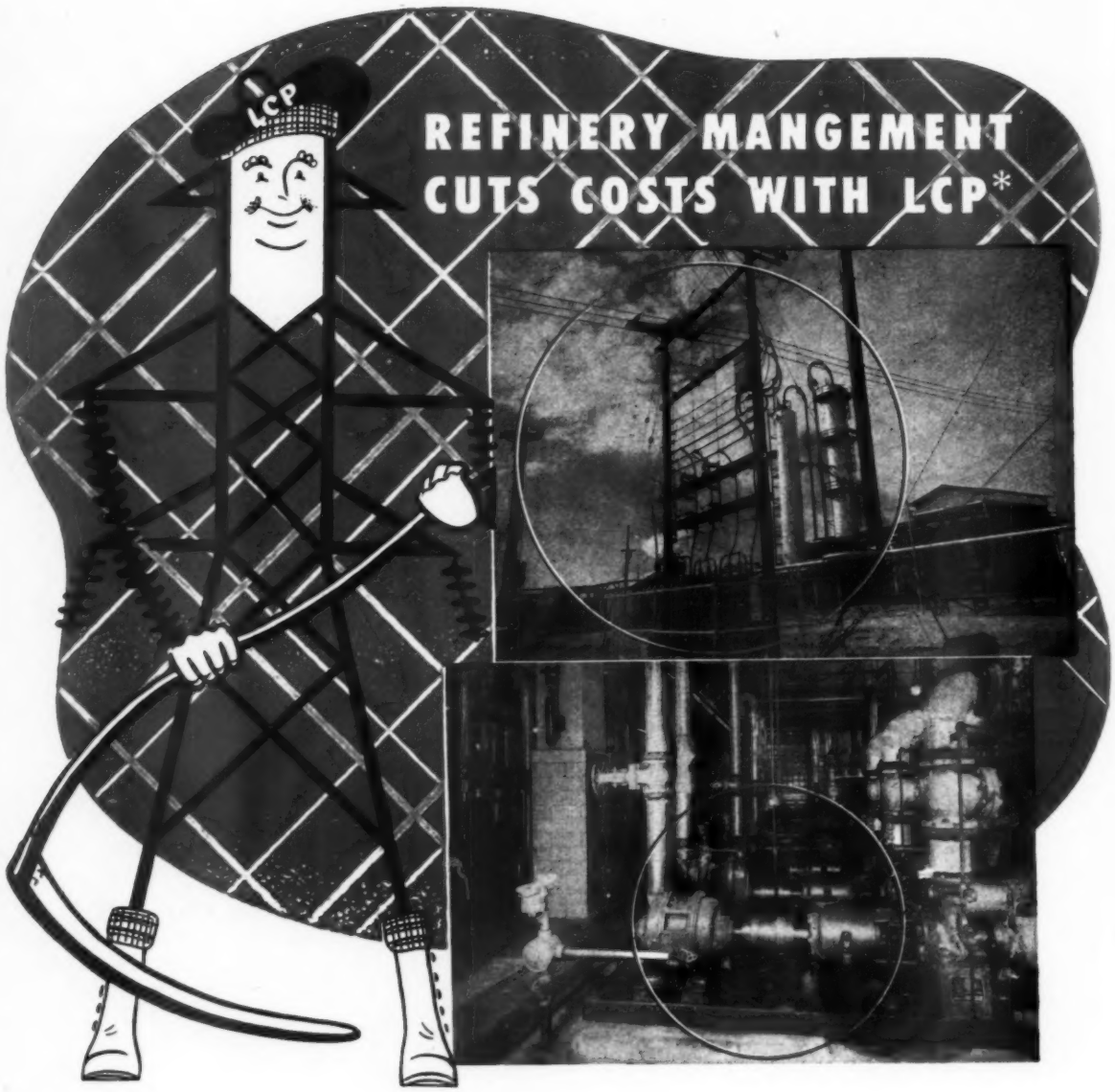

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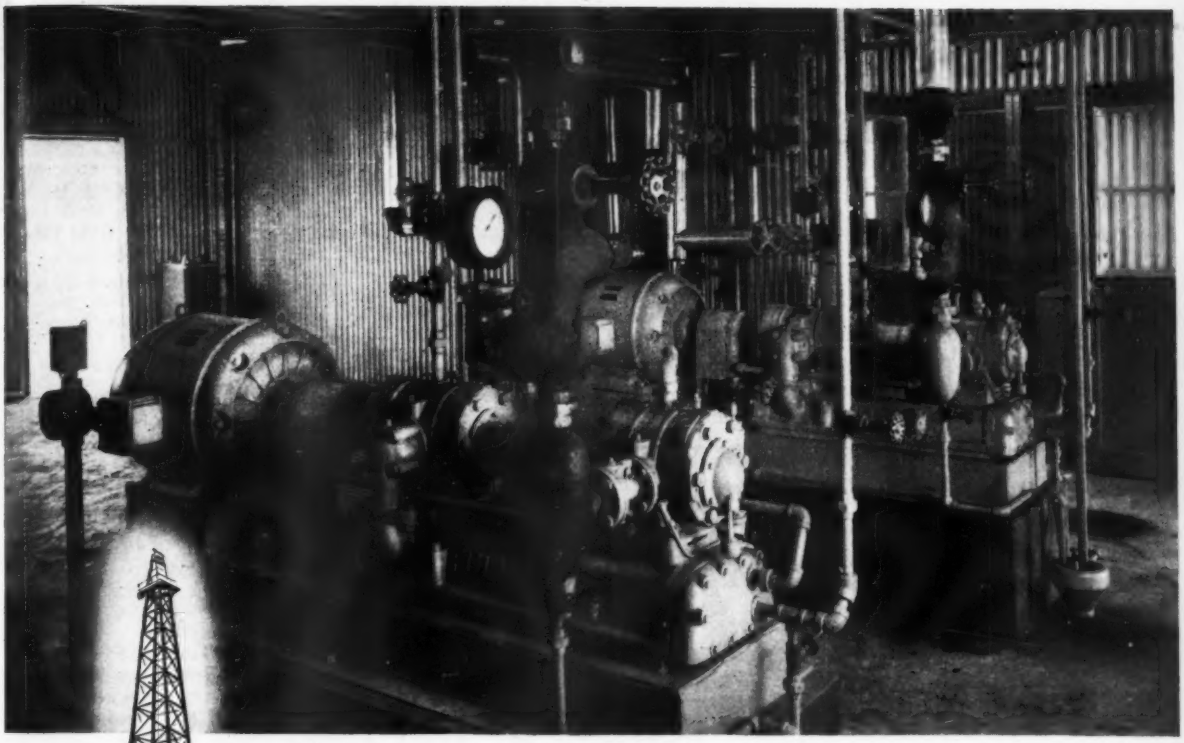

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They Say—

A Fair Field for All

"Years ago considerable natural gas produced in connection with crude oil was burned in the field. Because of this, the petroleum industry was severely criticised for 'wasting our natural resources.' This waste, however, was not due to any evil design. Gas was wasted only because it was valueless at the point of production. It had no value because it had no market and could not be stored. It had no market because it had no way to get to market.

"It is to the eternal credit of American industry that as fast as possible it finds markets for what were once waste products. Today the waste of natural gas is negligible. Industry has now brought it enormous distances to the great consuming markets of the nation. It now commands a price that makes it profitable to do so.

" 'Price finds oil' is an old saying in our industry. The public only cheats itself when it puts pressure on a legislative or administrative body to force prices below a reasonable economic level. As long as we insist on competition no product can long put any price gouge on the American consumer. Units within an industry compete, and different industries compete with each other such as the fuel industries. Wood, brick, stone, steel, and glass compete to build your home. Airplanes, railroads, motor vehicles and ships compete to take you there and bring you back. Let's keep it that way. A fair field for all, and political favors to none."

L. S. Westcott, president of Pure Oil Co., speaking to the Maumee Valley Petroleum Club in Toledo.

Established Policy

"The Interstate Compact to Conserve Oil and Gas sets forth that it is the duty of the commission to 'make inquiry and ascertain from time to time such methods, practices, circumstances, and conditions as may be disclosed for bringing about prevention of physical waste of oil and gas report its findings and recommendations to the several states for adoption or rejection.'

"Conservation of natural resources has become a fixed and well-established national policy. An enlightened public will no longer tolerate the wasteful use and destruction ot its resources. Public welfare demands proper utilization and development. It is to this end that the Interstate Oil Compact Commission is dedicated."

Gov. Roy J. Turner of Oklahoma, chairman of the Interstate Oil Compact Commission, speaking to the Independent Petroleum Association of America in St. Louis, October 3.

Not One Dime

"In the last 25 years the oil industry has plowed back $25,000,000,000, an average of $1,000,000,000 a year, into discovery and development of new oil reserves—or 60 cents out of every dollar received from the sale of crude oil: —that money was used to guarantee America from running out of oil. Not one dime of it came from government subsidy, either.

"The facts are that the oil depletion provision was written into the federal tax laws in 1926 after a long study and has been reviewed many times since and kept intact as a good business measure, in fact to increase tax revenue. It has been conclusively shown that drilling operations are extremely hazardous and that capital can be lost forever in dry holes."

Hoyt Ogram of Kanotex Refining Co., speaking at a meeting sponsored by the Chicago Oil Men's Club.

The Race Must Stop

"This offer was made notwithstanding an existing labor agreement which provides that there shall be no general wage increase or decrease prior to June 30, 1951.

"Nevertheless, we have serious doubts that this wave of wage in-

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creases, which must inevitably lead to still higher and higher prices, will prove of any lasting benefit to our workers or our national economy. At some point in this race between wages and prices, real statesmanship on the part of employes, employers, and the Government will have to be exercised if tragic consequences are to be avoided."

P. C. Spencer, president of Sinclair Oil Corp., commenting on the wage increase granted by his company.

Unique Position

"You instrument men are perhaps the most technical group concerned with the operation of a plant or factory. You have had more to do directly through your techniques to reduce the amount of manpower required to do a unit of work.

"You also have a high vantage point and a good opportunity to know what goes on in the whole operation of your plant. I strongly advocate your taking full advantage of this rather unique position. In order to do the best job of instrumentation, you should understand thoroughly the entire process with which you are working. It is important that you be familiar with the rest of the plant. You should take advantage of this opportunity to learn even though certain phases of the operation are out of your particular scope. Ask yourself repeatedly, 'Do I know and have a clear understanding of our whole objective? What can I do to make myself and my work more valuable to this objective?' "

John F. Lynch, president of La-Gloria Corp., at the Texas A. & M. instrumentation short course.

Apologists for Extravagance

"The oil industry and the American people in general should dedicate their thoughts and actions to the principle of economy in government.

"No one dares to condemn economy and efficiency in government, but there are some who willingly act as apologists for extravagance. There are people who are never at a loss for some elaborate excuse to justify the most wanton waste, the most flagrant overstepping of the bounds of fair taxation.

"Of course these persons preach government economy too, but they want all the economizing done on other people's projects. And the very same persons who insisted upon their projects being adopted are the persons who wonder and who complain bitterly at times because their taxes are not being reduced and the budget isn't being balanced.

"This country needs citizens who really believe in governmental economy—citizens who are so keenly aware of the need for lower taxes in all branches of government that their minds run only to means of reducing expenses and never to projects to increase them."

Leland K. Fishback, executive secretary, Indiana Petroleum Industries Committee, in the Hoosier Independent.

Iran's Position

"While Iran is close to Russia, people in this country should be reminded that it has been close for a long time, during which it has maintained its independent status.

"It is easy for commentators to get an erroneous impression of the imminence of a Russian invasion of Iran. The obstacles of mountain barriers are overlooked. Oil from the Iran fields would be unavailable to Russia to a practical extent without pipeline transportation. There are no pipe lines running north to Russia, and it would take several years to build one from Iran fields to such a Russian oil center as Baku, even in peacetime.

"Under wartime conditions, pipe laying would be much harder. Such construction would be so difficult and prolonged that it seems unlikely that Russia could successfully augment its oil supplies by wartime shipments from Iran."

J. E. Brantly, president, and Ralph W. Marshall, executive vice president, Drilling & Exploration Co., Abilene, Tex., in an interview in Tulsa recently.

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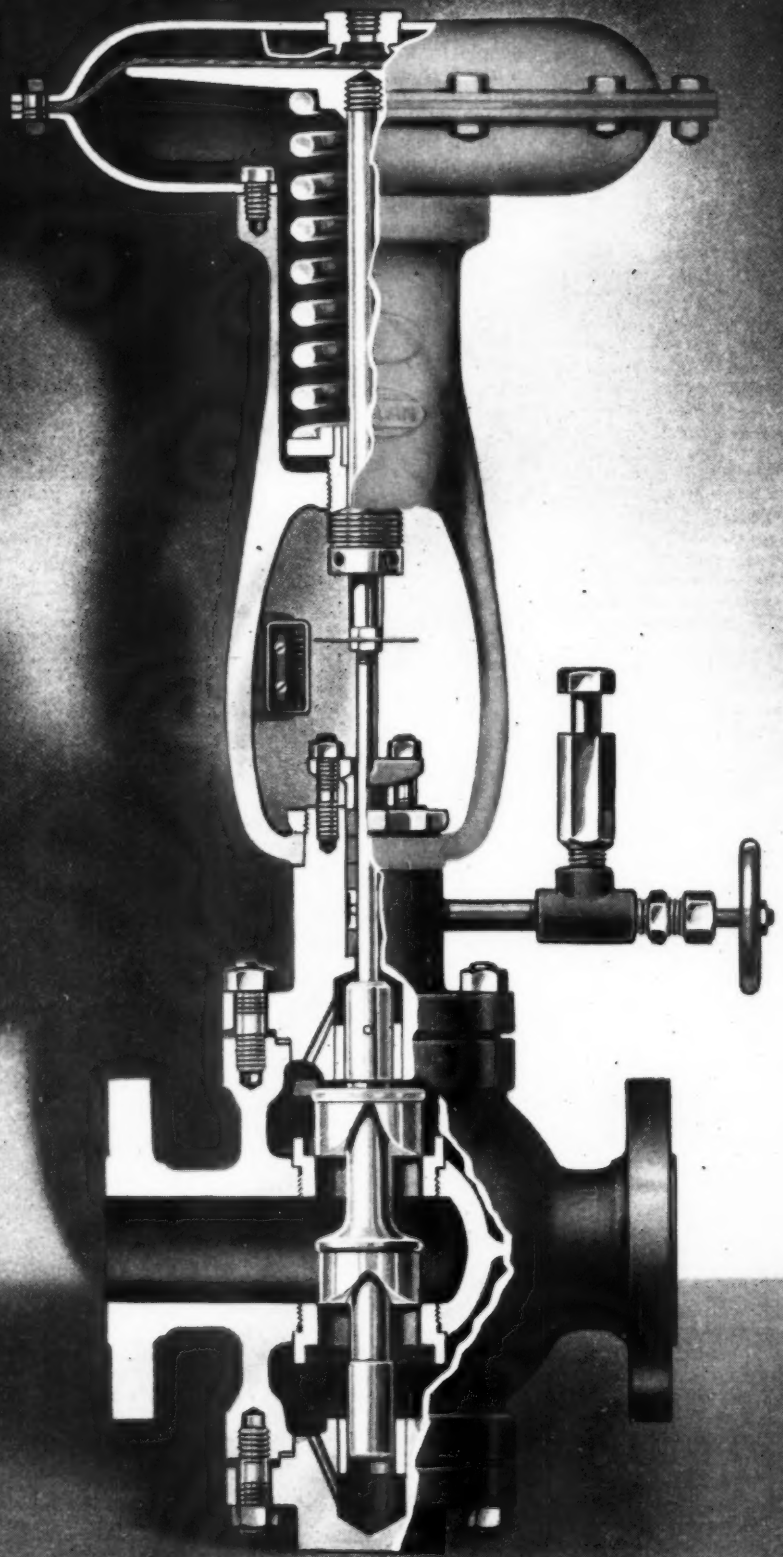

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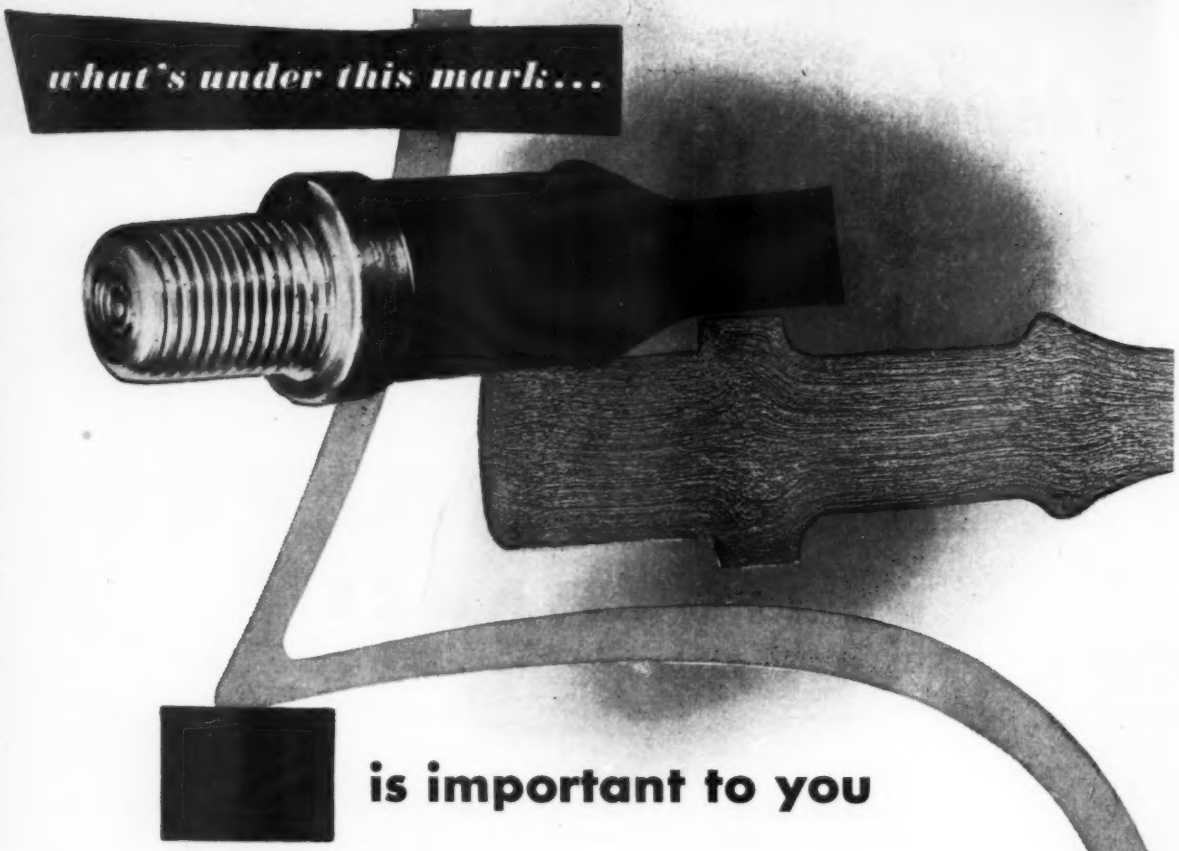

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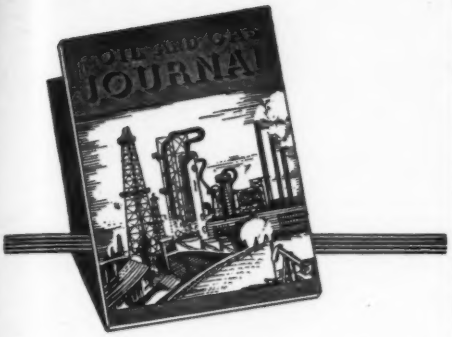

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JOURNALLY Speaking

Late on Alkylate

AN oil producer who admits he is not a refining expert but wants to keep up on all phases of the industry, writes in asking: What are alkylates?

Since alkylate of late has been in the industry news a lot we had to confess we were late in explaining it, so we asked one of our long-haired colleagues for a simple, layman's definition. He returned with a fat book on petrochemistry which he said told just all about it. Pressed for a definition, not a life history of the stuff, he located one which took only one page of jaw-breaking chemical terms which seemed to be outside the vocabulary of the average producer. After some coaxing he came back with the following, which, he said apologetically, is really an oversimplification:

"Alkylate is a synthetic gasoline having a very high antiknock rating. It is used generally as a blending component for aviation and present-day motor fuels for the higher-compression-ratio engines.

"In general, alkylates (high-octane hydrocarbons) are prepared under the influence of sulfuric acid or hydrogen fluoride. The basic feed stock for the alkylation process is butane-butene, a liquid at high pressures. This feed material, prepared commercially by another process known as isomerization, is alkylated to produce what is essentially isooctane. The blending properties of alkylate are generally superior to other hydrocarbon materials for antiknock raisers such as those produced by polymerization, another process for preparing a blending component for motor and aviation fuels."

We tried feebly to bring the term a little closer to earth with something similar to the old gag about the electrician's wife who asked "wire you insulate?," but gave up. If our producer friend can't understand the above, we can't be much further help.

But those of you who find this definition of alkylate very simple will want to read more about the alkylation process and related ways of juggling molecules in the special reports on petrochemistry appearing farther back in this issue, particularly the dissertations by Messrs. Egloff and Sweeney.

Petrochem

OLEFINS and paraffins, that's the way the list begins; ethylene and butylene seems to dominate the scene; alcohol and glycerol—we can't begin to name them all; aliphatic, cyclic ring, a little change makes some new thing; synthesis and catalyst both contribute to the list; alkylation, dehydration enter in the conversation; hydrogenation, polymerization spreading clear across the nation; new things are made with every pass of cuts of oil and natural gas.

It is possible to make half a million organic compounds from petroleum, says "Gus" Egloff in this issue.

This is petrochemistry, and it's getting to be quite some industry—one of the fastest growing in the country. For proof, just skim over the descriptions of plants, processes, and products given in this issue. We don't list them all, by any means; that would be impossible at the rate new things are coming along. But it does give an eye-opening picture of the size and diversity of this relatively new wing of the petroleum industry.

The oil industry was a chemical industry for a long time before it realized it. Even the simplest refineries of the old days actually were chemical apparatus. Then came cracking and all the other things that happen in a modern refinery. The present-day gasoline, particularly aviation gasoline, is really a highly complex chemical compound.

Gradually it dawned on refiners that if they could juggle molecules around to make gasoline that nature never made, they probably could do some more juggling and produce a lot of other new products, so now we have petrochemistry.

We think that everybody in the oil business ought to know a little of what's going on in this branch. which is why a section of this issue is devoted to it.

—Henry D. Ralph

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DOWELL ACIDIZING SERVICE . . . Backed by 18 years experience in the field and by an active research program

On February 11, 1932, a group of men from The Dow Chemical Company introduced *inhibited* acid into an oil well in central Michigan. Although the well was scheduled to be abandoned, production was increased from 3 BOPD to 8 BOPD! This marked the *beginning of acidizing service* in the oil industry.

Eighteen years and some 75,000 acidizing jobs later, Dowell Incorporated, organized as a subsidiary of The Dow Chemical Company to take the new process to the oil fields, is still pioneering in the field of oil well acidizing. Dowell is constantly at work developing new and better acidizing equipment and materials. Dowell Service engineers draw on the company's eighteen year backlog of experience to bring you improved acidizing techniques.

Dowell's comprehensive program of research and development is carried on with just one objective—to provide better, more effective services for the oil industry. Put this development and research to work on your well! The next time you need an acidizing job, "Look to Dowell". There is a Dowell station near you.

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NEWS

U. S. Oil Industry Spending 2 Billion Dollars for Expansion 29
Williams Bros. Gets Contract for $7,000,000 Plantation Line 29
Walter C. Teagle Named Recipient of A.P.I. Gold Medal Award. 30
Service Pipe Line in Final Steps of Separation From Parent Firm 31
Bureau of Mines Releases Data on Pipe-Line Mileage 32
Industry Looks for Continued High Demand for Lube Oils 33
A.I.E.E. Discusses Electrical Applications in Oil Industry 34
NPA Lays Basis for Priorities on Steel for Oil Industry 35
M. W. Boyer Named General Manager, Atomic Energy Commission 36
Rules Issued on Plants Eligible for Accelerated Amortization 36
Chapman Thinks All Avgas Needs Can Be Met 37
Decision Due on Whether Gas Industry Will Have Control Agency 38
U. S. Buys $10,500,000 Worth of French Alcohol 38
Stewart Says New Markets Needed for Alberta Crude 39
Southern California Demands for Gas Can Be Met This Winter ... 40
Kerr-McGee Spending $600,000 to Enlarge Wynnewood Plant 40
Pew Urges Everyone to Defend Industry Against Attacks 43
Railroad Commission to Hear Scurry Fields Production Problems 43
Venezuelan Operators Show Cautious Optimism for Future 44
African Firm to Build Plant to Make Petrol From Coal 46

SPECIAL REPORT: PETROCHEMICALS

Magic of Petrochemistry Opens New Oil and Gas Horizons 51
Chemicals from Natural Gas and Petroleum 69
Progress in Petrochemistry—A Technical Report 74

ENGINEERING-OPERATING

Don't Lose Your Hole Because of Slush-Pump Failure 84
Book Reviews 89
Questions on Technology 91
Refiner's Notebook—Graphic Instrumentation—2 95
Engineering Fundamentals—Gas-Drive Predictions 97

EXPLORATION-DEVELOPMENT

New Ellenburger Area Excites Texans 117
Highlights of Week's Developments 117
Reports by Areas Start on Page 119

DEPARTMENTS

They Say 18
Journally Speaking 23
Editorial 27
This Week 28
Watching Washington 37
International News 44
Personals 47
Deaths in the Industry 49
Pipe-Line News 99
Pipe-Line Construction 101
Drilling Contractors 107
Refining News 111
Natural-Gas News 114
Exploration Statistics 132
Production Statistics 133
Refining Statistics 134
Market Statistics 135
Equipment Men in News 137
Classified Advertising 140
Calendar of Events 144
Advertisers' Index 144

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Petrochemical Chain

The newest and fastest-growing use for petroleum and natural gas is in making chemicals. As shown in the special report in this issue, many refining companies are now in the chemical business, and many chemical companies are using petroleum as a raw material.

Although a relatively new industry, petrochemistry is big business. But as a market for oil and gas it is small in volume though highly profitable. Less than one-half of 1 per cent of the entire domestic production of crude oil and natural gas goes into petrochemical plants. Moreover, petrochemistry takes up where the rest of the oil business stops—at the end of a pipe line or a refining process.

Since petrochemistry is such a small consumer and is so remote from most of the industry, some may question whether it should be considered a part of the petroleum industry. That is too narrow a view.

The petrochemist and the wildcatter may seem to have little in common in their every-day work. But in a very real sense they are linked by a chain which runs through the entire industry, and what one does has a bearing on the other's activities and livelihood.

Progress in one part of the petroleum industry helps all other parts. New uses for natural gas, particularly near the point of production, enhance its value and make it more attractive to wildcat and to produce efficiently. Assured gas reserves make it economically possible to construct an expensive petrochemical plant. Where refinery gases are the chemical raw material, this outlet increases the refiner's profit margin and diversifies his income, thus helping to stabilize crude-oil prices.

Research into the chemistry and behavior of the hydrocarbon molecule develops techniques useful in manufacturing the major petroleum products, improving their yield and quality, and making refinery operation more flexible. This results in upgrading petroleum products to more profitable markets and reflects back into the income of the industry.

Refiners actually were in the chemical-process industry for many years before most of them realized or admitted it. The realization led to astonishing advances in refining, with resulting benefits to the public and to all branches of the oil industry. And not the least benefit was the research psychology and the scientific point of view which spread through all the industry's operations, including exploration and production.

Petrochemistry is a real part of the petroleum family. Already it has contributed much to the older branches of the family, and it can contribute much more. The market it provides for some refiners and some natural-gas producers helps all others, and its contributions to fundamental knowledge of the nature of petroleum aid the entire industry.

There is a community of interest and a mutual interdependence throughout the entire industry, from wildcatter to petrochemist.

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THIS WEEK

INDUSTRY—Capital investments by petroleum industry to total 2 billion dollars this year on expansion and new equipment, A.P.I. survey shows. . . . 1950 will be fifth consecutive year in which industry has spent more than 2 billion, and raises postwar expansion to more than 10 billion domestic investment and 12 billion over-all. . . . ¶Service Pipe Line in final stages of separation from parent company. . . . ¶W. C. Teagle named recipient of fifth A.P.I. Gold Medal Award for Distinguished Achievement. . . .

SUPPLY—NPA lays basis for future priorities on steel for petroleum industry. . . . ¶Russell Brown of I.P.A.A. asks Government to aid in combating gray market which now affects supply of tubular goods. . . . ¶Interior Secretary Chapman says he is confident all needs can be met for aviation gasoline. . . . ¶Industry looks for continued high demand for lube oils, as sudden shortages ease. . . .

PRODUCTION—Texas Railroad Commission to hold special hearing on production problems of Scurry reef fields. . . . Drop in bottom-hole pressures may result in sharp cutback in daily per well allowable. . . . ¶Oklahoma raises allowables only 75 bbl. daily for November; Louisiana sets output 3,000 above October's; and Kansas sets production at same figure, 300,000 bbl. daily. . . . ¶Elk City field of Oklahoma to be unitized under Corporation Commission order. . . .

WASHINGTON—Regulations released on plants eligible for continuous amortization. . . . Flock of requests expected to be filed following action. . . . ¶Government purchases 10,500,000 gal. of alcohol from France for use in production of synthetic rubber. . . . Farm bloc and farmers object to alcohol imports when supply in this country is adequate. . . . ¶Economic agreement signed by U. S. and Canada which will assure supply of materials to carry out defense plans. . . . ¶M. W. Boyer of Esso Standard named general manager of Atomic Energy Commission. . . .

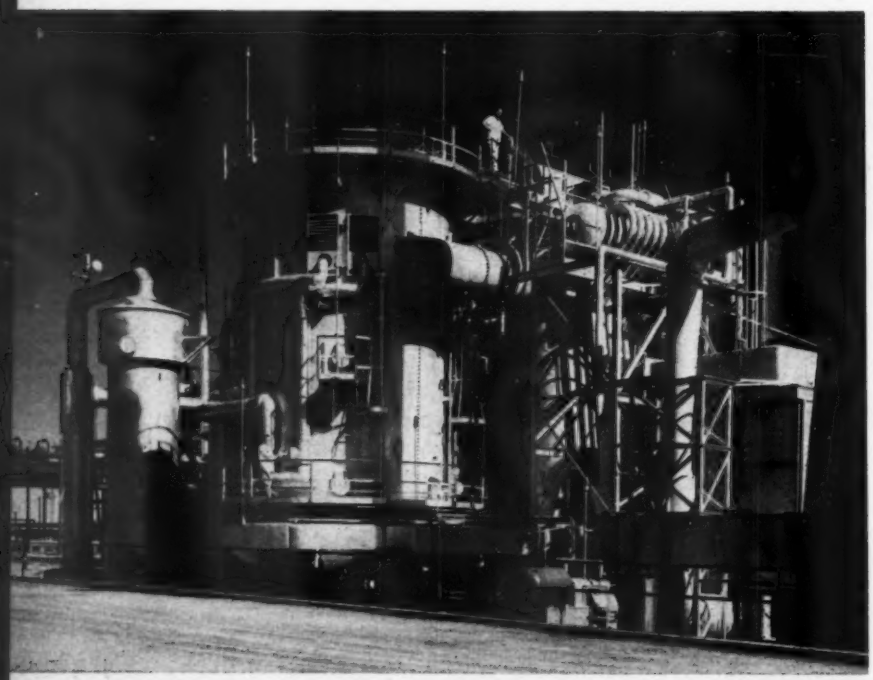
ACTIVITY—Crude production for week ended October 28 averaged 5,819,225 bbl. daily, down 2,300 bbl. daily from previous week. . . . ¶Total well completions increased by 12 to 946 wells for the week. . . . Number of wildcat completions at 182 wells was unchanged from previous week. . . . ¶Rotary rigs operating in United States reached the all-time high of 2,385 rigs on October 23. . . .

TIDELANDS—Texas Atty. Gen. Price Daniels files objections to decree sought of Supreme Court by Justice Department in Texas tidelands suit. . . . ¶Two firms ask Texas Supreme Court to compel state to pay back $123,360 in rentals on leases in disputed tidelands. . . .

TRENDS—Inventories of crude and four major products have increased 20,100,000 bbl. or 575,000 bbl. daily in the 5-week period ended October 21. . . . Reported figures indicate a stock gain of 7,211,000 bbl. in the last week of the period. . . . ¶Residual inventories increased 1,185,000 bbl. in week ended October 21 compared with a net gain of only 966,000 bbl. between the end of March and October 14. . . .

INTERNATIONAL—Venezuelan oil operators look toward future with cautious optimism. . . . Company-government relations reported good. . . . ¶South African firm to erect plant to produce petrol from native coal. . . . ¶Route being surveyed for possible new products line in Portuguese East Africa.

PIPE LINES—Williams Brothers Co. gets contract to lay Plantation's $7,000,000 products line. . . . Work scheduled for completion by end of 1951. . . . ¶U. S. Bureau of Mines releases data on pipe-line mileage, fill, sizes. . . . ¶Trunkline Gas Co. advancing survey for 1,300-mile microwave-communication system. . . . ¶Southeastern Michigan Gas Co. proposes 55-mile pipe line to carry gas into new Michigan market areas. . . .



PETROCHEMICALS START HERE.—In this gas-reforming furnace at the Jayhawk Works of Spencer Chemical Co. natural gas is reacted with steam and air to form raw methanol and ammonia, the first step in making fertilizer, refrigerant, antifreeze, formaldehyde, dry ice, nitric acid, and many other chemical products. How far the oil industry has gone into the business of making chemicals and where this may lead is told in a special section on petrochemistry starting on page 50 of this issue.

Capital Investments

U. S. oil industry spending 2 billion dollars this year for expansion and new equipment, A.P.I. survey shows

NEW YORK.—More than 2 billion dollars is being spent by the United States oil industry this year for expansion and new equipment, it is revealed by a survey just completed by the American Petroleum Institute.

Oil and gas companies reported their 1950 expenditures for capital investment at $2,400,000,000, with $2,172,000,000 for expansion in the United States and $228,000,000 for their operations abroad.

This is the fifth consecutive year in which the petroleum industry has spent more than 2 billion dollars in expansion and plant facilities, and raises its postwar expansion to more than 10 billion domestic investment and 12 billion over-all.

The 1950 figure is very close to the 1946-49 average, but the ratio for foreign investments is somewhat lower than in recent years.

More than half the total will go for production operations, as in past years. A total of $1,360,000,000 is going into leases, drilling, and construction of natural-gasoline plants and other production facilities.

Investments in refinery facilities this year will total $394,000,000, much of it for cracking and other processing facilities to increase efficiency and to improve the quality of petroleum products.

Transportation.—Expenditures for transportation total $324,000,000, divided as follows: $120,000,000 for crude-oil pipe lines, $74,000,000 for products lines, $91,000,000 for natural-gas lines, or a total of $285,000,000 for pipe lines, and $39,000,000 for other transportation facilities. The expenditures for natural-gas and petroleum-products pipe lines are up sharply over recent years.

New marketing facilities will take $281,000,000 of this year's capital expenditures, also a new record.

In commenting on the results of the survey, Frank M. Porter, president of the A.P.I., said:

"The high level of investments maintained by the oil industry during the postwar years has brought the nation's ability to produce and manufacture gasoline, fuel oil and other petroleum products to their highest point in history. While this indicates that the oil industry is better prepared now than ever before to meet military and essential civilian demands, it must be recognized that military requirements fluctuate from day to day, and that unpredictable international events can change this picture rapidly. Adequate peacetime transportation, for example, does not necessarily mean adequate wartime transportation."

Comparison of figures.—The A.P.I. pointed out that the tremendous expansion undertaken by the petroleum industry to meet constantly rising demand for petroleum products, as well as the marked increase in the cost of doing business, can be seen in a comparative examination of the latest capital expenditure figures and similar figures for the years immediately preceding the last war. The figures show an approximate three-fold increase in the rate of investment.

In the 5-year period 1936 through 1940, the industry's capital investments totaled $4,083,000,000 and averaged $817,000,000 annually. Based on the estimates of 1950 expenditures, the outlay over the 1946-1950 period will total $12,171,000,000 and average $2,434,200,000 a year.

The same three-to-one ratio between expenditures generally exists for the various branches of the industry in the two periods.

The A.P.I. also pointed out that as a result of the unprecedented industry expansion in postwar years, the oil industry's crude production capacity has been increased 27 per cent, its refining capacity 21 per cent, and the nation's proved crude oil reserves 24 per cent.

SUMMARY OF CAPITAL EXPENDITURES BY THE OIL INDUSTRY
(Millions of dollars)

	Total company estimates	Actual	Yearly average	
Production:	1950	1949	1946-49	1936-40
Crude oil—leases, wells, equipment	$1,198	$1,270	$1,190	$427
Natural gas—leases, wells, equipment	57	65	61	22
Natural-gasoline plants	74	104	66	15
All other, including crude and gas marketing	31	18	24	11
Total production	$1,360	$1,457	$1,341	$475
Transportation:				
Pipe lines—Crude-oil lines	$120	$143	$137	$36
Products lines	74	31	41	10
Natural-gas lines	91	49	41	8
Marine	22	81	103	41
Tank cars	7	18	12	4
All other	10	10	15	2
Total transportation	$324	$332	$349	$101
Refining	$394	$508	$457	$124
Marketing	281	233	247	100
Other	41	62	49	17
Grand total	$2,400	$2,592	$2,443	$817
Facilities outside of the U. S. included in Grand Total	$228	$368	$347	$100
Total for domestic facilities	$2,172	$2,224	$2,096	$717

Plantation Contract

Williams Bros. gets job of laying $7,000,000 line

ATLANTA.—Plantation Pipe Line Co. has awarded Williams Brothers Co., Tulsa, a $7,000,000 contract for a parallel line to be constructed as the principal feature of its $52,000,000 expansion program, C. R. Younts, president, announced.

Work will start next month, scheduled for completion by the end of 1951. Several Williams Brothers spreads will be engaged in the undertaking.

The new project contracted by Williams Brothers consists of 432 miles of 18-in. for the Baton Rouge, La.,-Bremen, Ga., section, and 275 miles of 14-in. in the Bremen, Ga.,-Charlotte, N. C., section. All pipe is ⅜-in. wall, grade B seamless. National Tube Co. will furnsh all of the 18-in. by deliveries continuing from December 1950 to the end of May 1951. Jones & Laughlin Steel Corp. will make half of the 14-in. for deliveries in the second and third quarters of 1951, and the remainder of the 14-in. will be obtained from British sources through Esso Export Corp.

The Plantation system originally built in 1941 now consists of 1,261 miles of pipe line with 31 pump stations, including 456 miles of 12-in., 356 miles of 10-in., and laterals.

Throughput of the Plantation system has increased from a postwar low of 59,430 bbl. per day to more than 100,000 bbl. per day this year.

Expansion of facilities for line,

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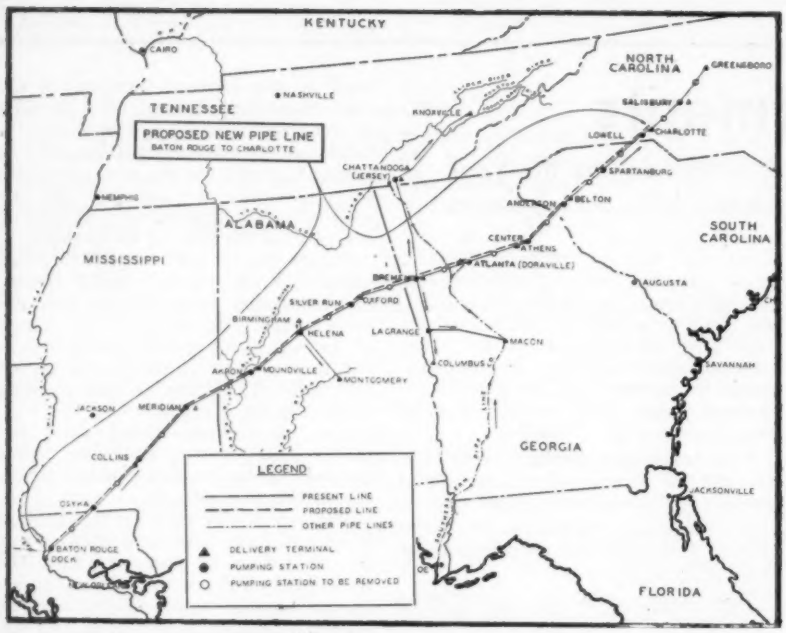

Route of Plantation Pipe Line Co.'s existing line, showing route of new line which will parallel present system.

stations, and terminals now being undertaken, will meet total requirements of 200,000 bbl. per day by 1960.

New arrangement.—A new arrangement of station facilities will provide approximately 120-mile station spacing on the new line; in 1952 this will give the whole system a capacity of 167,000 bbl. per day. (67,000 bbl. per day on the present line and 100,000 bbl. per day on the new line.) In the future it may be necessary to resort to 60-mile station spacing on the new line which would give the system capacity of 221,000 bbl. per day.

Existing intermediate booster stations on the present 10-in. and 12-in. lines will be removed from service and dismantled once the new large-diameter line is in operation. Some pumps from these intermediate stations will be revamped by the installation of new impellers and then relocated at the 14-in. line stations.

Pumping equipment at the four stations on the 18-in. section (Baton Rouge, Collins, Akron, and Silver Run) will consist, in the initial program, of three single-stage centrifugal pumps in series, each producing 250 psi.; with 50 psi. suction pressure. This gives a line discharge pressure of 800 psi.

In the future when a fourth pump may be added at each station, the line would be operated at 1,000 psi.

Pump in series.—Pumping equipment on the 14-in. line will be located at three stations—Bremen, Ga., Center, and Spartanburg. It will consist of two multistage centrifugal pumps in series with line-discharge pressure of 900 psi. At these stations the addition of a third pump would make possible line operation at 1,000 psi.

All pumps are to be directly driven by 3,600 r.p.m. induction motors. In all cases, the new pumping equipment will be housed in extensions of present Plantation pump stations. Control equipment for the new line will be in the same room at each station as the control equipment for the present line.

Gasoline will move through the new line and fuels through the present line. New manifolds, filtering, and metering equipment will be installed to serve the new line.

Products are introduced into the pipe line in batches of not less than 25,000 bbl. There are normally in transit 30 or more such batches. Line fill is 620,000 bbl. The Plantation system usually has between 1,750,000 and 2,000,000 bbl. in movement and in storage. Products are moved for 11 different shippers.

A.P.I. Award

Teagle will be fifth recipient of gold medal

NEW YORK.—Walter C. Teagle, former president and chairman of Standard Oil Co. (N. J.), has been chosen as the 1950 recipient of American Petroleum Institute's Gold Medal for Distinguished Achievement.

Frank M. Porter, A.P.I. president, said that formal presentation of the gold medal will be made to Teagle at the Institute's thirtieth annual meeting in Los Angeles later this month.

Teagle, now 73, was chief executive officer of Jersey Standard for 25 years, beginning with World War I, the period of the company's greatest growth. He also was one of the charter members and founders of the A.P.I. in 1919.

In addition to his duties as executive of Jersey Standard, Teagle contributed generously of his services to the Government. He organized the Share-the-Work program for President Hoover, and headed the National Industrial Advisory Board, and was a member of the National Defense Mediation Board and the National War Labor Board.

Established in 1946.—Teagle will be the fifth recipient of the A.P.I. gold medal, which is regarded as one of the nation's foremost industrial awards. It was established in 1946 to pay special tribute to prominent Americans who have made outstanding contributions to public welfare through the petroleum industry. Others holding the award are J. Howard Pew, Sun Oil Co.; Dr. Charles F. Kettering, scientist; Dr. William Burton, Standard Oil Co. (Ind.), and the late Henry Ford.

Teagle, who will address the general session of A.P.I. after receiving the gold medal, has maintained an office in New York City since his retirement, where he oversees the Teagle Foundation, an organization set up to help boys and girls receive higher education.

WALTER C. TEAGLE

States' Allowables Set

Oklahoma's Corporation Commission increased daily crude-oil allowables for November only 75 bbl. over the October level, and Louisiana's production has been pegged at 3,869 bbl. daily over last month's output. Kansas' production will remain the same as October's.

Oklahoma's daily output has been pegged at 477,960 bbl., which tops

the U. S. Bureau of Mines' estimate of 466,000 bbl. by 11,960 bbl. Nominations of purchasers totaled 513,156 bbl. daily.

Louisiana's output for November will be 615,872 bbl. daily, compared with 611,993 bbl. daily allowed in October. By districts, November's output will be: Houma, 113,644 bbl.; Lafayette, 149,968 bbl.; Lake Charles, 73,667 bbl.; New Orleans, 156,586 bbl.; Monroe, 71,326 bbl.; and Shreveport, 50,681 bbl.

Kansas' Corporation Commission set daily November production at 300,000 bbl., the fifth consecutive month at that level.

Texas' November allowable previously was set by the Railroad Commission at 2,722,705 bbl. daily *(The Oil and Gas Journal, October 28, 1950, page 59).*

Separation Program

Construction of building one of final steps in becoming entity apart from parent, Service Pipe Line head says

THE construction of its own building to house its headquarters operation was one of the final steps in a program of Service Pipe Line Co. to identify itself as an entity apart from its parent company and affiliates, President J. L. Burke declared in ceremonies dedicating the new building in Tulsa last week.

Burke's remarks, addressed to leaders of the petroleum and transportation industry invited for the occasion, were of particular interest because of current political pressures in some quarters to divorce the oil industry into its integral parts. Burke discussed this subject frankly, saying:

"While pipe lines have been common carriers for a great number of years, there are those who, because they are misinformed, believe we are not common carriers in fact. This belief is probably based on the pipeline company's close relationship with its parent company, which is but the natural result of the origin and function of the pipe line. Who but the refiner who needs the crude oil or has its products to market provides the incentive for the building of a pipe line and thus provides or guarantees the private capital to build it? But the proponents of the scheme of divorcement of pipe lines from their oil industry owners either cannot or will not understand this essential and inseparable relationship.

"Although we have at all times fully met both the letter and the intent of the law defining our common-carrier obligations, we carefully studied our operations and we came to the conclusion that to answer this type of thinking effectively and to put ourselves in a position to defend against divorcement either by legislation or litigation, we should divest our company of any noncarrier relations which might be misconstrued and distorted by those who seek every excuse to attack any segment of the oil industry and misrepresent it to the public.

Changes necessitated.—"This program, to achieve the desired results, necessitated many changes in internal organization. We started it in 1946. Since then our company has always had a full-time president—something it had not had for several years. Also, we have since eliminated interlocking directorships, common officers, and all joint service departments with affiliated companies.

"This year Service Pipe Line Co.'s new rules and regulations tariff becomes effective. In a number of respects this tariff departs from long-established wording of rules in the pipe-line industry. Perhaps the most significant break with pipe-line precedent is the abandonment of a minimum-tender requirement for shipment of oil. The effect of this change is to establish in plain language in our public tariffs what has always been our actual practice — that all shippers of oil, no matter how small, have free access to the use of the facilities of our pipe line.

Plans almost complete. — "Our plans for the necessary changes in organization were now almost complete. However, our name 'Stanolind' linked us with companies of the same name, and confusion in the public mind as to each company's identity had always been prevelant because of our occupancy of the same building with those companies. So in May of this year our name was changed to Service Pipe Line Co. 'Service' was selected as most descriptive of the company's function as a common carrier and comes closer than any other name we could think of to symbolizing our business—a business which serves hundreds of producers and shippers of crude petroleum.

"And now we have moved to our own building, the final and culminating step in our program, and that is why I say that there is much more to this new building than can be seen with the eye—it makes history in the pipe-line and transportation industries."

Industry pioneers. — Another feature of the program was an address by Paul Reed, pipe-line editor of The Oil and Gas Journal, who reviewed the history of the system which is now Service Pipe Line Co. Reed stressed the fact that the organization has done much pioneering for the pipe-line industry.

The system got its real start in 1916, he recalled, with construction of a trunk line from Drumright, Okla., to Chicago, which was the longest single pipe line of any kind built up to that time, was the first line to be equipped entirely with deisel engines, and which led to a new era of higher efficiency in pipeline pumping.

More recently, he said, the company was the first to take full advantage of large-diameter pipe, using it to replace parallel lines of smaller dimension along its trunk lines. Reed also said company personnel have been outstanding in inventive talent.

Paul Reed, pipe-line editor for The Oil and Gas Journal, delivering an address during ceremonies marking official opening of Service Pipe Line Co.'s new office building in Tulsa.

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Pipe-Line Survey

Some much-needed data on mileage, diameter, and fill of crude and products lines are given by Bureau of Mines

THE mileage of oil pipe-lines in this country is enough to circle the earth six times at the equator plus an east-west line across the United States, according to data from the Bureau of Mines survey of lines operating January 1, 1950.

Crude and product lines had a total length of 152,814 miles, made up from 60,560 miles of crude gathering lines, 71,373 miles of crude trunk lines, and 20,881 miles of product trunk lines.

However, total mileage figures for the different classifications do not present a true picture of the barrel-miles of liquids moved by each class since the pipe in gathering lines is much smaller than that in trunk lines. The cross-section area of the average crude trunk line is 75.7 sq. in. compared with 44.6 sq. in. for product trunk lines and 13.8 sq. in. for crude-gathering lines.

Line fill.—Relative sizes of lines can be shown best by volume of liquid required to fill the lines. Calculated line fill for crude trunk lines amounted to 35,306,000 bbl. at the beginning of this year. Refined products lines held 6,084,000 bbl. and crude-gathering lines required 5,473,000 bbl.

Total pipe-line length increased 25,463 miles, or 20 per cent, since the last survey, made in 1941. Refined products lines gained 11,880 miles, or 132 per cent. The increase of 7,390 miles for crude gathering lines represented a gain of 13.9 per cent compared with the gain of 6,193 miles, or 9.5 per cent, for crude trunk lines.

Sizes.—The trend toward large-diameter lines is shown by the breakdown of crude trunk-line mileage by line sizes. Lines with diameters less than 10 in. decreased 2,555 miles between 1941 and 1950. In contrast, crude trunk lines with diameters 10 in. and over gained 8,748 miles. Total crude trunk-line mileage gained 9.5 per cent in the period, but the amount of crude needed to fill the lines increased 50.6 per cent. The trend toward larger sizes was less pronounced for product lines, but lines of 8 in. or more diameter accounted for 8,062 miles of the total 11,880-mile increase for the period.

In 1926 Okahoma led all states in petroleum pipe-line mileage, but by 1931 Texas had moved into the lead and has increased the margin of the lead on each survey since that time. Texas accounted for 32.2 per cent of the total at the beginning of 1950.

Product lines are operated in 35 states with 8 of these states having more than 1,000 miles each. Only three states, Pennsylvania, Texas, and Kansas, have totals greater than 2,000 miles. Pennsylvania leads all states with 2,785 miles of products lines, but the lines are below the national average in size. This is indicated by the fact that the state accounts for 13.3 per cent of the mileage but only 12.7 per cent of the line fill. On the other hand, Texas has 12.6 per cent of products line mileage but 13.8 per cent of the line fill.

TOTAL CRUDE AND PRODUCT PIPE-LINE MILEAGE IN UNITED STATES

	Crude trunk lines	Product lines	Gathering lines	Total
1926	44,470	.....	45,700	90,170
1931	58,020	1,400	53,640	113,060
1936	57,820	4,600	52,760	115,180
1941	65,180	9,001	53,170	127,351
1950	71,373	20,881	60,560	152,814

CRUDE AND PRODUCTS PIPE-LINE MILEAGE BY STATES

State—	Trunk lines (including products lines) May 1, 1941	Trunk lines (including products lines) Jan. 1, 1950	Gathering lines May 1, 1941	Gathering lines Jan. 1, 1950	Total miles May 1, 1941	Total miles Jan. 1, 1950
Alabama	.....	284	.....	.....	.....	284
Arkansas	580	1,063	600	718	1,180	1,781
California	3,590	4,272	2,220	1,976	5,810	6,248
Colorado	115	584	90	133	205	717
Connecticut	22	22	.....	.....	22	22
Florida	78	78	.....	.....	78	78
Georgia	380	815	.....	.....	380	815
Illinois	5,087	6,248	1,850	3,201	6,937	9,449
Indiana	2,712	3,268	280	389	2,992	3,657
Iowa	1,014	1,327	.....	.....	1,014	1,327
Kansas	6,085	6,110	4,040	6,265	10,125	12,375
Kentucky	500	217	1,310	786	1,810	1,003
Louisiana	2,015	3,003	1,320	1,627	3,335	4,630
Maine	.....	200	.....	.....	.....	200
Maryland & D. C.	.....	77	.....	.....	.....	77
Massachusetts	153	177	.....	.....	153	177
Michigan	940	1,057	430	715	1,370	1,772
Minnesota	248	974	.....	.....	248	974
Mississippi	.....	438	20	393	20	831
Missouri	5,183	6,063	.....	.....	5,183	6,063
Montana	140	319	350	523	490	842
Nebraska	583	1,050	10	24	593	1,074
New Hampshire	.....	38	.....	.....	.....	38
New Jersey	259	328	.....	.....	259	328
New Mexico	450	594	900	1,618	1,350	2,212
New York	817	766	600	480	1,417	1,264
North Carolina	.....	111	.....	.....	.....	111
North Dakota	.....	81	.....	.....	.....	81
Ohio	3,109	4,307	4,940	3,299	8,049	7,606
Oklahoma	9,646	9,584	10,280	9,245	19,926	18,829
Pennsylvania	5,119	6,082	5,690	4,796	10,809	10,878
Rhode Island	17	13	.....	.....	17	13
South Carolina	.....	102	.....	.....	.....	102
South Dakota	24	182	.....	.....	24	182
Tennessee	.....	109	.....	.....	.....	109
Texas	23,465	29,034	13,420	20,149	36,885	49,183
Utah	80	287	.....	.....	80	287
Vermont	.....	59	.....	.....	.....	59
West Virginia	330	587	4,480	3,660	4,810	4,247
Wyoming	1,440	2,344	340	563	1,780	2,907
Total	74,181	92,254	53,170	60,560	127,351	152,814

CRUDE AND PRODUCT PIPE-LINE MILEAGE BY SIZES

Size* (i.d.)—	Trunk lines: Crude oil June 30, 1936	Crude oil May 1, 1941	Crude oil Jan. 1, 1950	Products May 1, 1941	Products Jan. 1, 1950	Gathering lines June 30, 1936	Gathering lines Jan. 1, 1950
2-in.	.....	.....	.....	.....	.....	19,620	17,249
3-in.	.....	.....	.....	.....	.....	9,220	9,655
Below 4-in.	1,270	1,050	1,233	162	391	.....	.....
4-in.	3,990	3,590	2,768	692	1,366	13,550	20,940
6-in.	10,460	12,570	12,254	3,781	6,696	7,680	9,224
Over 6-in.	.....	.....	.....	.....	.....	2,690	3,492
8-in.	27,060	29,380	27,780	4,230	9,979	.....	.....
10-in.	9,450	11,710	13,500	68	1,628	.....	.....
12-in.	5,510	6,710	9,027	68	817	.....	.....
Over 12-in.	80	170	4,811	.....	4	.....	.....
Total U. S.	57,820	65,180	71,373	9,001	20,881	52,760	60,560

*Data for odd sizes are included in next smaller size listed.

Outlook for Lubes

With sudden shortage easing, the industry looks for continued high demand, reversing its spring pessimism

George Weber

NEW YORK.—The present shortage of lubricating oils is beginning to show signs of easing off. But a tight lube-oil market is expected to continue for some months to come and the long-range prospect is for a high level of demand and production in this country for the next few years.

Up to this summer the industry generally believed it faced a substantial excess in producing capacity over projected demand. The record construction of solvent refining units placed on stream in the past 2 years new capacity of 35,000 or 40,000 bbl. per day. While gradually rising domestic consumption was rightly anticipated, export shipments were expected this year to begin a decline which would eventually reduce foreign demand to a small volume as new solvent units began initial operations abroad.

Temporary shortage.—In contrast to the expected ample supply of lubes at this time, a severe though temporary shortage has resulted and refiners' stocks now stand at the lowest point in many years. Both domestic and foreign demands have risen sharply since this last summer.

Two unrelated and unpredictable events precipitated the present situation. The summer shutdown of an estimated 15 per cent of the nation's lube-manufacturing capacity by strikes first indicated a tightening supply situation. Then came this country's participation in the Korean war which brought on a very substantial and unexpected rise in total demand on United States production sources. The cumulative effect of those two events was a precipitous decline in refinery inventories and a sharp upward price reaction.

Catching up.—With reactivation of capacity shut down by strikes, the industry has adequate capacity to relieve the present shortage in a few months. But a third factor, the increased demand arising from an accelerated defense program, has emerged to extend the period during which the industry can catch up on production. In addition, the growing military and industrial needs will tend to support a high lube-oil demand for an indefinite period. Refiners estimate that from 3 to 6 months will be required to fill demand and build up inventories to a normal level.

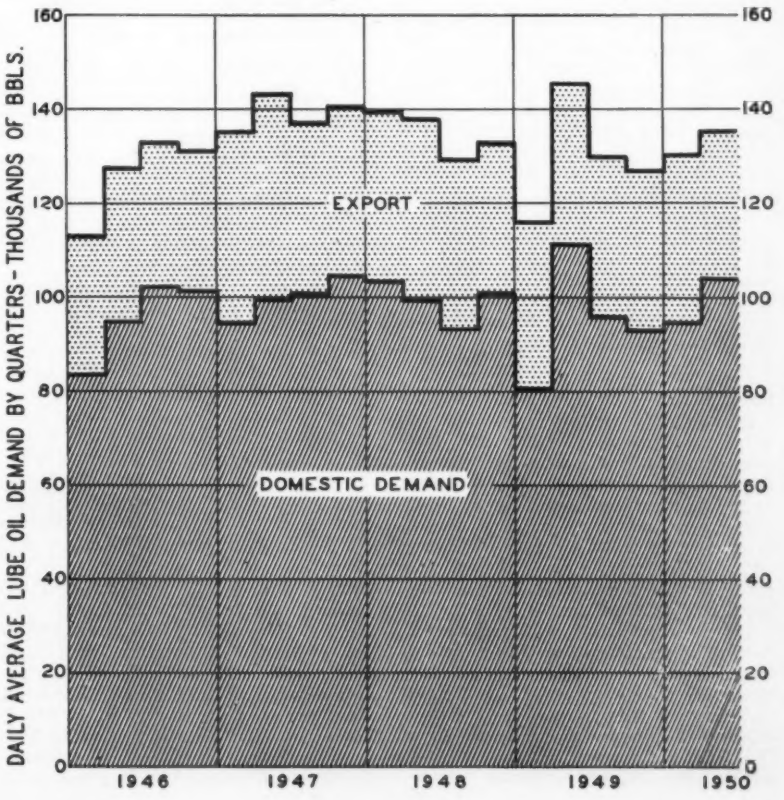
Early this year the estimated United States capacity for production of lubricants was 180,000 bbl. per day. Domestic demand averaged about 95,000 bbl. per day and exports stood at about 35,000 bbl. per day. This excess capacity, bolstered further by completion of the few remaining new plants then under construction, brought about the shutdown of a number of older plants of the so-called conventional type, not employing solvent methods. By midyear the nation's producing capacity remained at about the same level of 180,000 bbl. per day.

Summer slump.—The strike shutdowns then temporarily removed about 20,000 bbl. per day from operation, and cost an estimated 2,000,000 bbl. in summer production. The seasonal spring rise in domestic demand was accomplished by export movements which continued fairly high. Industrial recovery in Europe had progressed faster than estimated a year ago, and the expected decline in demand on United States production had not yet been felt in the degree anticipated.

The latest official statistics on lubricants, compiled by the U.S. Bureau of Mines, are for July 1950 (see charts). They do not reflect the pinch which developed shortly after. Total demand on United States production rose from an average of 130,500 bbl. per day during the first quarter of 1950 to 135,000 bbl. per day during the second quarter, and jumped sharply during September and October to a peak reliably estimated at between 160,000 and 170,000 bbl. per day. Reflecting increased bids from both domestic and foreign buyers, this upsurge in demand after Korea prevented the industry from catching up on the production losses occasioned by strike shutdowns.

Stocks.—Stocks at refineries showed a steady drop from 9,341,000 bbl. at the end of February 1950 to 7,427,000 bbl. on July 31. Thereafter inventories at refineries declined at a much faster rate, and have plummeted to long-time lows, variously estimated as low as 3,800,000 bbl. Opinions differ regarding the level of finished lube inventories. Some observers believe that some of the drain on refinery stocks went into increased inventories at distributor and retailer levels. Others discount this possibility. No instances of depletion at service stations are known to have occurred and the possibility of such spot shortages is considered unlikely.

While the domestic industry presently may be taxed to catch up with an unexpected demand, it is in a sound position to produce the lubricants which would be needed in a possible war emergency. The national potential for high-quality lubricant production is the highest in history. Without expansion of present capacity, some reduction in civilian con-



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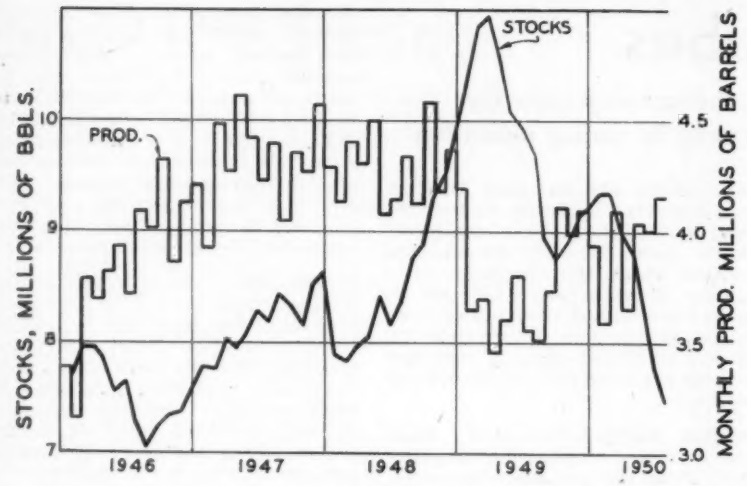


sumption might result from an all-out mobilization, but reactivation of idle facilities and construction of new units could meet total demand as it arose under such conditions, it is generally believed.

Prices.—Spot prices for lube stocks have reacted quickly to the short supply of the recent past. Wholesale prices now quoted are about double those of 6 months ago. In shortest supply are the higher viscosity components, particularly bright stocks. This shortage is already being corrected by altering some individual plant operations to increase production of heavier stocks with relation to lower-viscosity oils.

The outlook for prices is a matter of conjecture at this time. Some observers look for a nominal reduction from the present peak of spot quotations, but do not expect any sharp price break. Others believe that prices are now leveling off and will remain substantially at their present levels for some time to come.

The basis for anticipating such a firm market is the defense program. As refiners gradually pull out of the present shortage they will face increased military requirements and a rising demand for lubricating the stepped-up industrial program for defense.

New plants.—Europe, rebuilding its lube capacity, will by late 1952 become essentially self-sufficient. Foreign facilities for making solvent-refined lubes are planned for other areas. In the Caribbean, for example, Shell companies are now installing capacity for 2,000 to 2,500 bbl. per day at Cardon, Venezuela, and recently a similar project was announced for Curacao, N.W.I.

The outlook for construction of new lube plants in the United States was a remote one a year ago. Today, however, five companies are known to be considering the addition of new solvent refining facilities and two of the five may announce their plans within the next few months.

The record postwar construction of new lube-oil manufacturing capacity, coupled with the retirement of many older conventional-type plants, has boosted the proportion of solvent lube capacity in this country to about 70 per cent of the total. Solvent-refined oils comprise an even higher percentage of production at present, and within a few years over 90 per cent of domestic lube oils will be solvent-refined.

A.I.E.E. Meeting

Electrical applications in oil industry discussed

John C. Reidel

OKLAHOMA CITY.—A number of technical papers of interest to the oil industry were presented at the 5-day fall general meeting of the American Institute of Electrical Engineers, as more than 1,200 electrical engineers and scientists representing all sections of the United States and several foreign countries convened at the Skirvin Hotel here October 23-27.

Two sessions on oil-industry applications were held on October 27, during which a group of papers was presented dealing with electric oil-well pumping. These included: "Development and Operation of Reda Submergible Pumps," by Joe Carle, Reda Pump Co.; "Selection of A.C. Motors for Driving Oil Well Pumping Units," by M. H. Halderson, Phillips Petroleum Co.; "Selection of Electric Motors for Oil Well Beam Pumping," by J. N. Poore, General Electric Co.; "Electric Oil Pumping," by F. K. Smith and W. C. Dreyer, Westinghouse Electric Corp.; and "Design and Application of A.C. Induction Motors for Crude-Oil Production," by G. A. Smith, Shell Oil Co.

In a paper presented by T. C. Lloyd, Robbins & Myers, Inc., on "Application of Electric Motors to Oil Production," it was noted that 20,076 wells were placed on artificial lift in the United States in 1949. The estimated number of oil wells being pumped by electric or other means in the United States in 1950 is 408,861.

"How the Petroleum Industry Uses Electric Power," by W. H. Stueve, Oklahoma Gas & Electric Co., presented tables showing total equivalent kilowatt-hours required in drilling, production, pipe lines, and refining, and the amount of electric power as such (generated and purchased) consumed in these four phases of the petroleum industry. Other tables and charts were presented with further discussion of electrification in each phase of the industry. K. E. Burg, Geophysical Service, Inc., discussed "Electrical Engineering in Exploration of Petroleum." Seismic exploration and magnetic methods were treated in general. A review of the operation of the airborne magnetometer and of electronic surveying systems such as Shoran and Loran was given.

Cathodic protection.—A conference on cathodic protection included papers on "Various Cathodic Protection Applications Using Graphite Anodes," by J. P. Oliver, Union Carbon & Carbide Corp.; "Devices and Electrical Cable for Cathodic Protection," by W. P. Lewis, American Steel & Wire Co.; and "Cathodic Protection of Stainless Steel Buried in the Ground," F. J. Mollerus, General Electric Co.

Demonstration of a "fluid mapper" was given by Prof. A. D. Moore, University of Michigan, following his paper on "Further Development of Fluid Mappers." Developed during the past 2 years, the fluid mapper consists of a plaster or stone slab placed in a tray. The surface of the slab is coated with potassium permanganate. When water flows over the slab various flow patterns appear in streamline fluid flow, depending on the design of slab. Vicual simulation of heat conduction, electrostatic, electromagnetic or other analogous fields is made possible. Possibility of future applications of the fluid mapper in the petroleum industry, as in study of flow of oil through sands, made this demonstration of particular interest.

Other developments.—Other developments of scientific interest at the A.I.E.E. meeting concerned the use of large-scale computing devices (electronic punch-card machines) and their application to the petroleum and chemical industry. T. J. Connolly, S. P. Frankel, and B. H. Sage, California Institute of technology, discussed "Application of Automatic Digital Computing Method to the Prediction of Phase Behavior." Additional papers in this group covered "Application of the Multicomponent Fractionation Electrical Analogue Computer," B. M. Brown, J. H. Ashley, J. J. Moder, and G. W. Goelz, Northwestern University; "Use of I.B.M. Punched Card Devices for Distillation Calculations," Arthur Rose and T. J. Williams, Pennsylvania State College.

Steel for Oil

NPA lays basis for priorities on steel for oil industry; Brown asks government help in combating gray market

Bertram F. Linz

WASHINGTON.—Basis for the establishment later of priorities for the production and delivery of steel for oil industry operations was laid last week by the National Production Authority in an amendment to its M-1 order providing for DO (defense order) rating for steel required to fill orders from the military and Atomic Energy Commission.

The new order was issued as steel for oil threatened to become the same major headache for the Petroleum Administration for Defense as it was for its predecessor, Petroleum Administration for War, throughout World War II.

Specifically, it provided that "NPA will from time to time approve scheduled programs calling for the production and delivery of steel products for stated purposes, over specified periods of time. Upon approval of major programs of this type, supplements to this order will be issued describing such programs and specifying the manner in which they are to be carried out by the steel industry.

Also during the week, the NPA supplemented an earlier order providing priority for chemicals and containers required by refiners to fill military orders *(The Oil and Gas Journal, October 26, page 55)* with an order extending priority to steel for the production of 10,000 or more new freight cars monthly during the first quarter of 1951, including some 600-700 tank cars.

Clamp-down.—Of no great immediate concern to the oil industry but indicative of the trend of thinking, in Washington, the NPA, in still another order, clamped down on the construction of new buildings for amusement, recreational, or entertainment purpose, and warned that further limitations will be imposed on the erection of buildings "which do not further the defense effort or increase the nation's productive capacity." Anyone starting construction which, while not prohibited now, does not further the defense effort runs the risk of being unable to complete the project, the agency said.

The NPA's action in paving the way for priorities on oil-industry steel followed on the heels of reports that producers in many areas are encountering serious difficulty in securing tubular goods. Also, during the week, the Independent Petroleum Association of America, through Russell B. Brown, its general counsel, had raised its voice against the growing gray market and continued, and in its mind of doubtful desirability, exports of line pipe for the Middle East.

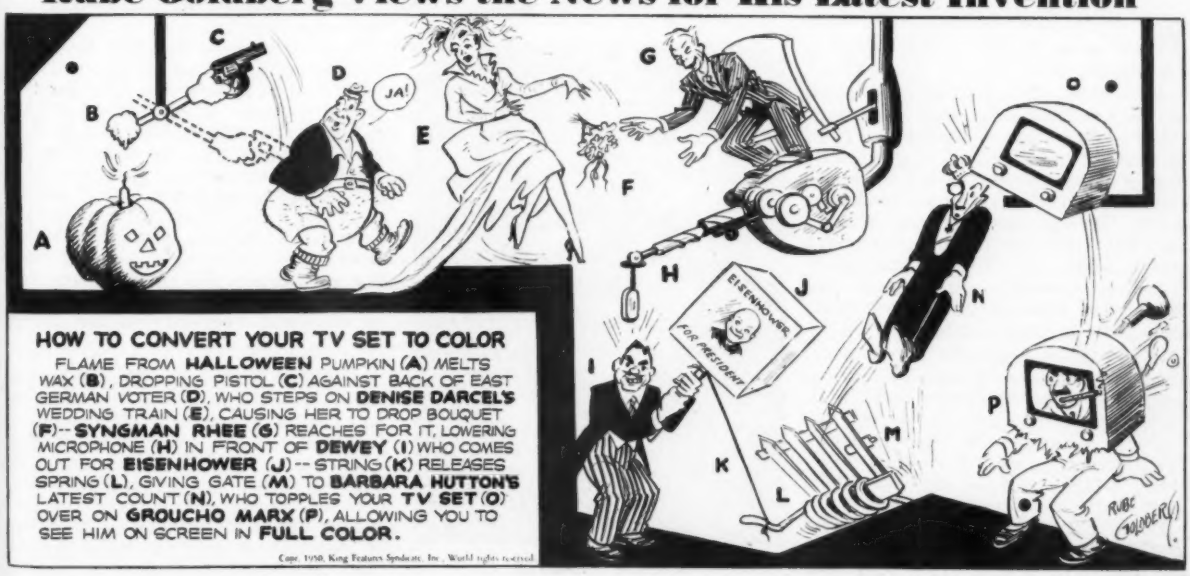
Cites gray market.—The gray market was attacked by Brown in letters to Interior Secretary Oscar L. Chapman, NPA Administrator William H. Harrison and Texas Senator Lyndon B. Johnson, chairman of the armed services preparedness subcommittee in which it was pointed out that the shortage of tubular goods is one of the most serious problems now facing producers and is "aggravated by the practices of the gray marketers, that is, persons who are not and never have been an established element in the distribution of tubular goods, but have manipulated into the distribution channel solely because of the shortage situation."

The inventory regulation of the NPA, Brown contended, while aimed primarily at the prevention of unnecessary stockpiling or accumulation of excessive inventories of the materials in short supply, is broad enough to reach gray marketers since, "inasmuch as a gray marketer has no use for oil field tubular goods, any quantity that he may have in his possession would be in excess of the 'practical minimum working inventory' and therefore his possession of the pipe would be in violation of Regulation No. 1."

"I shall appreciate your advice," Brown wrote, "as to whether or not it would be possible for the PAD to assist in correcting this condition by seeking an interpretation from the NPA pointing out that the regulation does apply to gray marketers and that such persons found in violation thereof are subject to the penalties prescribed. In this way, attention would be focused on the situation brought about by the gray marketer in oil field tubular goods.

"It is our opinion that an official

Rube Goldberg Views the News for His Latest Invention



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XUM

pronouncement by the NPA with respect to this matter would be most helpful in eliminating the gray market which is causing serious disruptions in the supply of pipe moving to the producing branch of the oil industry."

Suggests conference.—A joint conference of producers and distributors of oil-field tubular goods and representatives of the oil industry with PAD and NPA officials would be helpful in reaching a full understanding of this matter, "which involves practices condemned by both the steel industry and the oil industry," Brown suggested.

In a report to I.P.A.A. President J. Ed Warren, Brown also condemned the issuance of export licenses for pipe for the Kirkuk-Banias line of the Iraq Petroleum Co., which he said raises the same question of diversion of steel from home needs as was involved several years ago in the export of pipe for the Arabian American Oil Co. Saudi-Mediterranean pipe line.

"We are told that there is the gravest necessity for arming for defense and for the mobilization of our industrial resources in the United States," Brown commented. "Steel is a point of great concern with many industries and the situation is critical in the oil producing industry. When its use is authorized for a project in an area which military experts concede would be most vulnerable to attack it would appear that closer attention should be paid to the way materials are being employed."

Atom Head

M. W. Boyer of Esso named general manager of AEC

WASHINGTON.—A veteran oil man has been named to the nation's top atomic post.

Marion W. Boyer, vice president of manufacturing for Esso Standard Oil Co., has accepted the position of general manager of the Atomic Energy Commission, Gordon E. Dean, commission chairman, announced last week. He succeeds Carleton Shugg, who has been serving as acting general manager since the resignation of Carroll L. Wilson on August 15. Shugg has resumed his former post as deputy general manager.

Boyer's resignation from Esso Standard climaxes 23 years of service with the Jersey Standard organization. During that time he served in various capacities in the research, manufacturing, and executive divisions, which included the direction of Esso's Baton Rouge refinery.

Dean said that the commission "is gratified that Boyer has accepted the top management post in its staff. He brings to this key place in the atomic energy program broad executive and technical experience and a record of outstanding success as the director of large-scale manufacturing and research operations. His record as a working scientist and an executive in development insures effective teamwork with research men as well as production operators in the atomic energy program.

"At this time of urgent need for speed, efficiency, and growth in atomic energy output and development, we are fortunate to command his talents."

"Opportunity to serve."—Boyer said that while it was not easy for him to leave Esso Standard, he is eager to enter on the new work, and was proud in the fact that the commission turned to the oil industry for management experience.

"This is a tremendous opportunity for public service," Boyer said. "If my efforts can further the commission's program, I shall be amply repaid. I look forward with enthusiasm to working in association with the commission, and the outstanding scientists, engineers, and contractors in the atomic energy program."

M.I.T. graduate.—Boyer, a native of Muncie, Ind., took his bachelor's and master's degrees in chemical engineering from the Massachusetts Institute of Technology, and served in the institute's laboratory of applied chemistry before joining Esso Standard in 1927.

Among the positions he held with the Jersey organization were: chemical engineer, assistant laboratory director, laboratory director, director of Standard Oil Co. of Louisiana and assistant general manager of manufacturing; vice president and refinery manager; executive vice president of Standard of Louisiana; vice president and director in charge of Louisiana operations for Standard Oil Co. (N. J.); and contact director for manufacturing, supply, and transportation and chemical-products operations.

MARION W. BOYER

Plant Regulations

Order released on plant amortization eligibility

WASHINGTON.—Issuance this week of the regulations under which new plants and expansions will be eligible for accelerated amortization is expected to be followed by a flood of applications for approval of new refinery facilities and pipe lines.

Under the tax law enacted this year, plants certified as "emergency facilities" may be amortized over a 5-year period instead of their anticipated useful life, enabling industry to pay for them out of funds which otherwise would go to the Government as taxes. For the oil and gas industries, applications will be passed on by the Petroleum Administration for Defense before being finally acted upon by the National Securities Resources Board which has been designated as the agency through which certifications will be issued.

Not every project presented as designed to meet emergency requirements will be approved, and in some instances applicants will be given certificates for only part of a project—that part which the NSRB determines to be needed for defense production as contrasted with expansions of output to meet increased civilian demand.

Under the regulations, necessity certificates can be issued for any facility, land, building, machinery, or equipment constructed or reconstructed, erected, installed, or acquired, subsequent to December 31, 1949, which is found to be in the interest of national defense during the emergency period.

A material or service may be found to be in the interest of national defense if it is directly required for the armed services or auxiliary personnel, for civil defense, the Atomic Energy Commission, any operation or activity in connection with the mutual defense assistance act, if necessary for the production of materials or services directly required in the interest of national defense during the emergency period, necessary for the operation of the defense program, or otherwise necessary in the interest of national defense.

Consideration given. — Consideration also will be given to whether there is an existing or prospective shortage of facilities for the production of the materials or services to be produced by the facility to be certified, including "an over-all shortage, the necessity for and adequacy of facilities or materials or services for a particular region, the necessity for stand-

XUM

WATCHING WASHINGTON

Bertram F. Linz

Salary Troubles

Lack of a clear-cut decision waiving the statutory prohibition against the acceptance of outside salaries by government officials is contributing to the delays which have been noted in the filling of important defense agency posts.

Men who have been tapped for key agency jobs, like Bruce K. Brown who is expected to head the Petroleum Administration for Defense, have hesitated to accept appointments unless they are assured they will be able legally to continue to receive salaries from companies from which they will be on leave.

The Department of Justice is understood to be preparing an opinion, which undoubtedly will provide for a waiver of law since otherwise it will be impossible for the Government to get the services of many men best fitted for the jobs assigned to them.

Men holding high-salaried positions in industry are not always wealthy, and frequently have commitments or responsibilities which they could not carry out on the sharply limited salaries paid by the Government. The most that can be expected by men coming in under the defense program is $14,000 a year which, after taxes, doesn't leave much for a man who has to maintain himself in Washington while supporting a family back home.

The Imports Question

The approaching end of military operations in Korea is raising the question, in independent oil circles at least, of what the import picture will be next year.

Current indications are that 1951 imports will average 1,000,000 bbl. or more daily, around 400,000 bbl. more than we were averaging at the outbreak of hostilities in Korea and maybe 175,000 bbl. more than recent imports. Whether the end of the shooting in Korea will result in a decrease in defense requirements to the extent that these imports will cause cut-backs in domestic production is the big question.

Spokesmen for the independent operators say emphatically that the imports question was only temporarily shelved by Korea and the fight to control the entry of foreign oil has not been abandoned.

The matter of imports now is somewhat more complex than it was last spring when congressional committees were investigating it at the instigation of oil and coal operators. One new factor is the abrogation of the Mexican trade agreement which again brings into play the quota provisions of the Venezuela treaty and provides for a 100 per cent increase next year in the import excise tax on entries of oil in excess of 5 per cent of this year's throughput in continental United States refineries.

Whether the additional 10½ cents per barrel will be any deterrent to the import of foreign oil is a debatable question, with independent producers claiming it will not.

Also to be considered is the position of defense officials that the domestic industry must be maintained in a strong position as a primary matter of security.

Lobbying Costs

The House lobbying investigation committee has come up with a lot of figures purporting to show that industry spends millions of dollars in lobbying, but even Chairman Frank Buchanan of Pennsylvania admits that very little is spent in direct efforts to influence legislation and complains that most of it goes to influence public opinion, an activity in which members of Congress also engage.

A compilation of responses received to a questionnaire sent out by the committee discloses that the oil industry does spend several million dollars a year along the lines under investigation, but that most of the money goes to industry associations, some of which, like the American Petroleum Institute, make no attempt to influence legislation, and many which interest themselves in congressional matters only when some subject which touches their membership directly is involved.

The questionnaire also revealed that some oil companies are under considerable expense for trips to Washington by their officials, who in most instances go to testify before committees considering specific bills, generally at the committee's solicitation, or to attend meetings of advisory committees set up by government agencies.

A few companies maintain Washington offices, and a few have books or pamphlets published and distributed on matters of interest pending in Congress, but only three or four reported any expenditures under the Federal Lobbying Act.

by capacity, and other factors contributing to or threatening a shortage of facilities for producing such materials or services."

In determining the portion of a facility attributable to defense purposes, consideration will be given to the probable economic usefulness of the facility for other than defense purposes after 5 years.

No certificate will be issued for acquired facilities previously constituting the productive assets of a going concern, or second-hand facilities, unless there is clear prospect of a substantial increase in their usefulness for national defense which cannot be obtained by other practical means, or substantial loss of usefulness for national defense would probably result in the absence of such acquisition. Replacements will not be certified if they would have been made, at or about the time made, regardless of the emergency, and land will not be certified unless its acquisition is directly related to production, storage, transportation, or protection of supplies necessary in the interest of national defense.

Other considerations. — Other considerations will include: assurance of fair opportunity for participation by small business; promotion of competitive enterprise; competence, performance record, and other factors bearing upon the ability of the applicant to manage the proposed expanded facilities effectively; location of the facility with due regard to military security; the availability of manpower, housing, community facilities, transportation, and other elements of production, and methods of financing.

Avgas Shortage

Chapman thinks all needs for product can be met

WASHINGTON.—Interior Secretary Oscar L. Chapman expressed his confidence last week that the oil industry, working with the Petroleum Administration for Defense, will overcome the aviation-gasoline shortage, present and prospective, although he foresaw that additional expansion of production next year will become increasingly difficult to achieve.

Chapman voiced his satisfaction over the manner in which the industry is attacking the problem, issuing a formal statement that, "as a result of cooperation by the petroleum industry, encouraging progress has been made in increasing production of aviation gasoline for military use, but the problem of providing needed supplies is by no means completely solved.

"Although we have made considerable progress in reducing the prospective shortage for the remainder of

XUM

1950," Chapman explained, "we have not yet worked out means of completely closing the gap between production and requirements. Further, it is anticipated that aviation-gasoline consumption will increase markedly in 1951, as mobilization proceeds."

Military needs. — Meanwhile, the Armed Services Petroleum Purchasing Agency made known its anticipated requirements for the first half of 1951, disclosing that it would call upon the industry for a 50 per cent increase in the supply of motor gasoline and for substantial increases in diesel and Navy special fuel oil, but nearly 1,000,000 bbl. less of aviation gasoline than required for the current half-year. Motor gasoline requirements were given as 2,410,000 bbl. compared with 1,640,000 bbl. for the last half of 1950, and aviation gasoline was figured at 23,698,000 bbl. against 24,582,000 bbl.

These figures, however, were little more than estimates of minimum requirements. They are based on requests from the services predicated upon the appropriations now available and will be increased if, as anticipated, additional funds are granted by Congress, especially as regards aviation gasoline. An additional military appropriation of $10,000,000,000 is expected to be requested by President Truman next month.

It was this probability that aviation-fuel requirements will be increased by several million barrels that led Chapman to warn of next year's difficulties, and defense officials discussing the matter with oil men also are urging that the industry use every effort to raise its production.

Gas Control

Decision due on whether industry will have agency

WASHINGTON.—Decision as to whether the gas industry is to have a defense agency of its own or, as originally contemplated, be included with the oil industry in the Petroleum Administration for Defense is expected shortly to be a matter for consideration by the National Security Resources Board.

Gas-industry representatives last month urged Interior Department officials to splinter PAD so as to put gas under separate control. Their major argument was that the gas industry is now mature, equally as important as oil, and should not be subjected to domination by oil men. There is considerable sympathy for this point of view in some department quarters.

The major bone of contention between the two industries would be the supply of materials. In some gas circles it is feared that if a choice had to be made between supplying pipe for an oil line and for a gas-transmission line the scales would be weighted in favor of the former, although PAD officials have said they would consider transportation as a whole and from the point of view that expansion of gas service to new areas would aid in the conservation of oil.

On the other hand, there are some in the oil industry who would favor a separate agency for gas, fearing that some action taken under the defense program would so interlock the oil and gas industries as to ease the way for the Federal Power Commission to extend its authority to the oil operations of producers who also have gas output.

Military interested.—Interested in the matter, but strictly on the sidelines, are the military, to whom oil is more important than gas. But when the gas industry appealed to Interior for its own agency it also sent a copy of its appeal to the National Securities and Resources Board and since it appears difficult for Interior to make a decision the board is expected to intervene. Under the Defense Production Act, President Truman has assigned NSRB Chairman W. Stuart Symington as coordinator of the mobilization program and arbiter of controversies in and between the federal agencies.

The board, reportedly, will seek an informal agreement between the gas and oil industries, probably by calling an over-all meeting at which the probelm can be talked out from the divergent points of view, and will make a formal decision only if consultation fails to bring results.

Economic Agreement Signed

WASHINGTON.—An agreement for economic cooperation to assure that the production and resources of both countries be used for common defense was signed last week by the United States and Canada.

The compact follows the lines of the so-called "Hyde Park agreement" entered into between the two countries in 1941 and in effect treats the resources of both countries as reserves in common.

The six-point agreement provides for development of a coordinated program of requirement, production, and procurement; establishment, as it becomes necessary, of coordinated controls over the distribution of scarce raw materials and supplies; free exchange, where feasible, of technical knowledge and productive skills involved in essential production for defense; and removal, as far as possible, of barriers which impede the flow of goods essential for the common defense effort between Canada and the United States.

Under the Hyde Park agreement, Canadian oil production was treated in the same manner as domestic operations.

French Alcohol

U. S. buys 10,500,000 gal. for synthetic rubber

WASHINGTON. — Plans of Rubber Reserve to purchase a reported 112,000,000 gal. of alcohol from France for use here in synthetic-rubber production will probably be the subject of investigation this month by Senator Guy M. Gillette of Iowa, chairman of the Senate Agriculture Committee.

The Reconstruction Finance Corporation has disclosed that some 10,500,000 gal. of the alcohol were purchased for December-January delivery at 42½ cents per gallon, and the remainder will be bought at 48½ cents per gallon for delivery throughout 1951.

It has been reliably reported that France has informed Rubber Reserve that she will need gasoline to replace alcohol which is used there in motor fuel and may have raised the possibility of getting it on Economic Cooperation Administration financing rather than by use of the free dollars she will derive from the alcohol deal. Another report is that France will seek ECA assistance to secure sugar to offset that used in the production of the alcohol.

Neither report has been confirmed by government officials, but Gillette's investigating staff is understood to have been digging into the matter and may submit a report to him this week on which he will decide whether to go into the subject.

Farmers object. — Gillette and other members of the congressional farm bloc, the Department of Agriculture and farmers with stocks of wet corn on their hands have been expressing their objections to the purchase of foreign alcohol so long as there are large surplus stocks of grain and potatoes in this country.

The French deal also may come up for discussion this week at a meeting scheduled by National Production Authority officials with representatives of 15 industrial alcohol producers, including L. V. Steck of Shell Chemical Corp. to consider the industrial-alcohol problem in connection with the synthetic-rubber and other defense programs. Officials said the purpose of the meeting will be to canvass supply and demand, the capacity of the industry to meet all requirements and the problems of raw material supplies.

RFC officials said it will be necessary to supplement the French purchases with additional quantities of alcohol to meet rubber production requirements. The domestic industrial alcohol producers have reported they will be unable to supply any sizable portion of these requirements, and arrangements are being worked out with beverage distillers to supplement the available supply.

New Markets Needed

Stewart says pipe line to Montreal would be justified if other markets cannot be developed for Alberta crude oil

CALGARY, Alta.—There is the possibility of extending the market of western Canadian crude oil to Montreal, where more than 104,000 bbl. daily of modern refinery capacity services Quebec and eastern Ontario, according to G. L. Stewart, president of Imperial Oil, Ltd.

Stewart, addressing the Canadian Club here, said that Montreal represents a potential market for western crude oil, but involves large capital expenditures to duplicate present economic supply facilities. A pipe line to the city could be justified "if other markets cannot be developed to absorb Alberta's growing potential," he said.

The oil-company president said that markets and money are the keys to success in the next stage of western Canadian oil developments, and that future problems are "to discover and develop the new fields necessary to supply larger markets, and to build pipe lines to those larger markets.

Costs high. — "The cost of this program would mean minimum additional capital expenditures of $800,000,000 and more likely of one billion dollars," Stewart said. This is above the $500,000,000 which has already been spent to develop prairie crude reserves and markets.

"This would mean," he said, "that crude-producing capacity for 400,000 bbl. daily requires capital funds, including expenditures already made, of between one and one-quarter and one and one-half billion dollars. The magnitude of this sum is indicated by the fact that it is equivalent to $100 for every Canadian, and to more than $400 per man, woman, and child in the prairies where so much of this vast expenditure will be concentrated."

Exploration for new fields is becoming increasingly costly, he reported, as the search expands into the less accessible areas and the whole enterprise is concerned about making the most effective use of the capital involved. Therefore it is desirable that drilling in already discovered fields "should not be carried on at a rate in excess of sound economic requirements."

Stewart said that he was confident that the markets could be expanded and the money found, but emphasized that "we will have to exercise all our skills and husband all our resources if the best possible results are to be obtained."

First step.—"The first step for enlarging the market for western oil is for the Interprovincial Pipe Line Co. to increase the capacity of its line by the addition of pump stations, and by further storage at Superior in order that the line may operate at full capacity the year 'round. This will also require the Ontaria refiners to add enough storage capacity to permit them to operate on Alberta crude during the season of closed navigation on the lakes."

Stewart said that a market in the Pacific Coast area has been under study for some time. "A factual appraisal of the situation shows that the total requirements for oil in British Columbia are considerably short of the volume needed to support pipeline construction through the Rocky Mountains." He said that the project cannot be justified unless additional volume is secured by entering the Washington and Oregon markets.

"This entire northwest coastal area of Canada and the United States has been traditionally dependent on California crude and largely on California refining capacity," Stewart said. "In fact, there is only about 30,000 bbl. daily of refining capacity in the entire area, compared to a demand somewhat in excess of 250,000 bbl. per day of products. Availability of crude oil in the area at an economic cost should be a stimulus for additional refinery construction, he said.

100,000 bbl. daily.—He predicted that by 1952 prairie refining capacity for light crude would have risen to 100,000 bbl. daily. He said he was informed that Interprovincial Pipe Line Co. expected the last stretch of its line to Lake Superior will begin to be filled with oil by November 5.

After navigation opens next spring, Stewart said, and the oil moves to Ontario refineries, the market for Alberta oil will be increased from the current 85,000 bbl. daily to 131,000 bbl. during the open navigation season.

Gas Reserves Increased

Although exploration for gas in western Canada is inactive because of the lack of market outlets, large increases have been made in known

***NEW OFFICE BUILDING.**—Above is The California Co.'s new office building in New Orleans, which was recently opened. The company occupies three of the seven office floors in the 10-story structure, which comprises 119,000 sq. ft. of space. The building is at 1111 Tulane Avenue.*

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gas reserves as a result of drilling for oil.

According to a recently issued Canadian Government survey, reserves of natural gas in the prairie provinces now total an estimated 7 trillion cubic feet. This represents an increase of 2.1 trillion cubic feet in the last year and a half.

WEST COAST

Gas for California

Southern demands can be met with storage, imports

D. H. Stormont

LOS ANGELES.—Greater use of underground-storage facilities coupled with increased imports of natural gas from Texas fields has placed southern California gas companies in a position to take care of heaviest anticipated peak demands during coming winter months.

The Texas-California 30-in. pipe line, completed in 1947 by Southern California Gas Co. and Southern Counties Gas Co. in collaboration with El Paso Natural Gas Co., and subsequent looping projects provides some 405,000 M.c.f. daily to the two California companies. At peak-demand periods this volume represents only about one-third of the supply required. Thus from the standpoint of meeting peak-demand loads the companies' underground-storage projects at La Goleta and Playa del Rey are as important as the pipe line.

Under their contract with El Paso, the two companies must take practically the full 405,000 M.c.f. of gas both summer and winter. In summertime demand for gas for domestic and commercial use often is only about one-seventh of that on a cool winter day. Thus much of the time gas is available for injection into the two storage projects in anticipation of peak demands.

At La Goleta, located 100 miles northwest of Los Angeles and about 8 miles west of Santa Barbara, the 5,000-ft. reservoir has a storage capacity for about 50 billion cubic feet of gas at 2,000 psi. Compressor facilities have been increased to the point that about 80,000 M.c.f. can be injected daily.

Deliveries to increase.—Present deliverability from Goleta is 275,000 M.c.f. daily. Next year this will be stepped up to 365,000 M.c.f., through the addition of two 20-mile sections of 22-in. line which will be looped onto existing transmission lines leading into the Los Angeles area. Further work planned will step up deliverability to an ultimate of 475,000 M.c.f.

Just west of Los Angeles similar storage operations are being carried out in Playa del Rey, in an exhausted oil reservoir. While smaller, the project is of vital importance in coping with quick changes in temperature—it can supply gas into the Los Angeles mains within 1 hour whereas some 4 hours are required for gas from La Goleta. Its estimated storage capacity is 1.25 billion cubic feet. Gas can be injected at rates up to 20,000 M.c.f. daily and withdrawn at rates up to 120,000 M.c.f. daily.

The pipe line and storage reservoirs during heavy-demand periods this winter will contribute approximately equal volumes. In addition to this some 800,000 M.c.f., an additional 450,000 M.c.f. (largely oil-well gas) can be used as needed to meet peak loads.

GULF COAST

Tidelands Objections Filed

WASHINGTON.—Objections to the decree sought of the Supreme Court by the Department of Justice in the Texas tidelands suit were filed with the court October 30 by Texas Atty. Gen. Price Daniel.

Opposing the issuance of any injunction before the area in which it is to be operative has been clearly defined, Daniel specifically objected to a proposed provision which would enjoin holders of state leases from carrying on activities on the ground they are not parties to the suit and stoppage of this production of oil would be against public policy and detrimental to the best interests of the state and nation.

Texas also contended the period of accounting for funds derived by the state from Tidelands operations should date from the court's decision last June 5 or, alternatively, from the filing of the complaint May 16, 1949, rather than from June 23, 1947, when the California case was decided. It was recommended also in this connection that the provisions of the decree relative to the determination of Texas' liability should cover the eventuality of inability of the state and the Department of Justice to agree by providing for appointment of a master upon the motion of either party to make the determination.

The state's brief said it was filing its objections subject to the court's action on a "pending" petition for rehearing and only in the event the petition is overruled, but court attaches said no such petition has yet been filed nor has the court's permission to submit it been requested.

Firms Ask Lease Refunds

AUSTIN.—Two oil companies asked the Texas Supreme Court last week to compel the state to pay back $123,360 in rentals on leases in the disputed tidelands.

Attorneys for the oil companies contended the obligation to pay state rentals was "set at rest" when the federal Government filed suit to secure paramount rights over the offshore lands.

Ohio Oil Co. and Melben Oil Co., the litigants, argued before the court that the state had no right to collect rentals on their leases while the tidelands case was pending in the U. S. Supreme Court. Attorneys for the companies cited a 1941 Texas law which suspends the operation of the primary term of the oil and gas leases during litigation involving the land. Thus, they said, the companies were relieved of the obligation of payment of rentals covering 89 leases on 123,360 acres of land in the Gulf of Mexico for the period that the tidelands cases was pending. The moneys involved, representing $1 per acre per year delay rental, was paid under protest on November 7, 1949.

Answering that the companies were required to pay the rentals or forfeit the leases, Atty. Gen. Price Daniel told the court: "They didn't have to hold the leases if they thought it was too risky under the pending litigation. . . . they had the option to drill, to pay the delay rental, or to let the leases go."

SOUTHWEST

Refinery Expansion

Kermac spending $600,000 at Wynnewood plant

WYNNEWOOD, Okla.—Remodeling and expansion of the refinery of Kerr-McGee Oil Industries, Inc.—expected to be completed by December 1—will result in an increase in the plant's daily crude-oil capacity to 10,000 bbl. daily.

The program will also add 4,000 bbl. daily crude-storage capacity to the plant, and will involve an expenditure of $600,000.

The firm's pipe-line system is being extended to more than double the crude available to the refinery, and to provide an additional outlet for southern Oklahoma crudes.

Consisting of remodeling, conversion, and additions to the present fractionating towers, the refinery-expansion program will also increase the steam power-plant capacity. Also included is remodeling of the light-oils treating section, and installation of additional products-cooling sections.

Products-storage tanks, with capacity of 150,000 bbl., are being constructed in addition to the added crude-storage tanks.

New pipe line.—Kermac is now constructing a 21-mile, 6-in. crude-oil line from its Butterly station,

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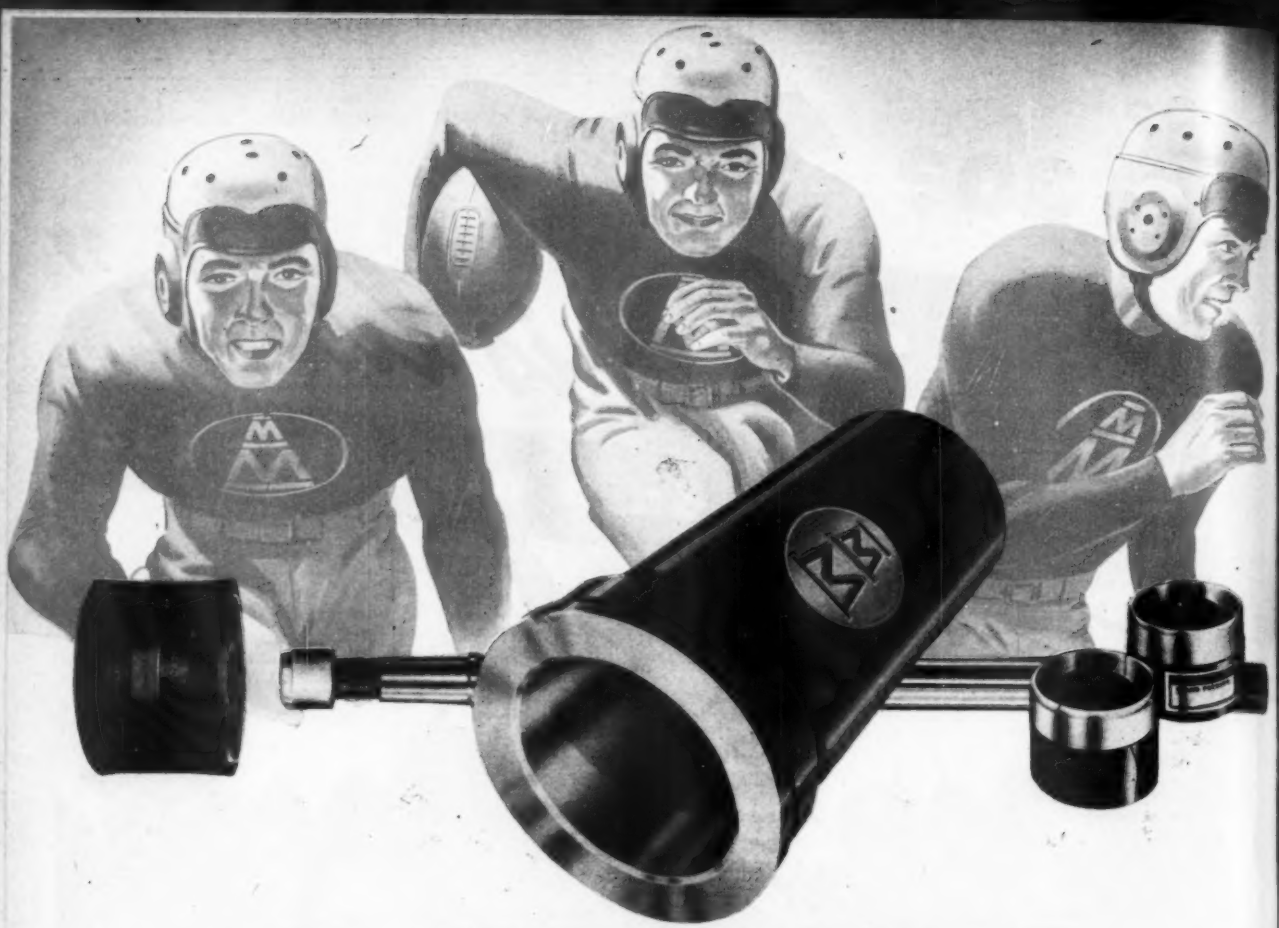

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5½ miles southwest of the refinery, to the Tussy station, with pumping facilities. This line will give added outlet for crude from the Wildcat Jim, Robberson, Tussy, Velma, Sholem Alechem, and other fields.

The present 4-in. crude line from the refinery to Tussy will be extended 27 miles to Sunray, Okla., and converted into a products line. A 6-mile gas line is being converted to crude-oil transportation, and a 5½-mile crude line will be placed in gas service.

Acquired in 1945.—The Wynnewood refinery was acquired by Kerr-McGee about 5 years ago. At that time its crude-oil capacity was from 2,000 to 2,500 bbl. daily. Before the present remodeling work, the firm spent more than $1,000,000 in modernizing and expanding the facilities.

Defense Urged

N.G.A.A. told everyone must sell oil industry

TYLER, Tex.—Everyone in the oil industry must speak out at every opportunity to defend his business and his livelihood against the current onslaught of attacks aimed at undermining public confidence in the industry, said James E. Pew, vice president of Sun Oil Co. and president of the Natural Gasoline Association of America, in opening the southern regional meeting of the association here October 27.

Never before has the oil business been under such heavy and outrageously unjust attack as this year, he said, and as a result business management, already burdened with the task of satisfying the interest of customers, employes, stockholders, and tax collectors, is today compelled to operate in a fog of legal threats and harassments.

A similar note was sounded by A. B. Hardey, independent oil producer of Shreveport, who said that the industry can meet all demands placed upon it in peace or war if given sufficient steel and kept free from unnecessary government controls.

Among the technical papers presented there was special interest in a report on the potential value of the new Platforming process to the natural-gasoline industry, presented by W. F. Fulton of Warren Petroleum Corp., Houston. His general conclusion was that Platforming is of limited application because it is designed to make light products from heavier feed stocks, whereas the primary need of the natural-gasoline industry is a method of "heavying up" its very light products.

Platforming economic. — "The Platforming process," Fulton said, "is economic for raising the octane of a mixture of hydrocarbons boiling between 150°-400° F., containing sufficient quantities of naphthenes and normal paraffins to be converted to aromatics and iso compounds. If there are sufficient naphthenes the product would be valuable for the recovery of the aromatics, such as benzene and toluene.

"Platforming is good for hexanes plus, and only can be used on that portion of natural gasolines. If there is sufficient condensate or straight-run gasoline, Platforming is both economical and a low-investment-cost process.

New process needed.—"What the natural-gasoline manufacturer needs is a process that will convert the butanes and pentanes into a product of lower vapor pressure and higher density. The only method available at the present time to accomplish this is dehydrogenation of normal butane and alkylation with isobutane to give a low-vapor-pressure, high-density product. Of course, this type of material can then be blended with additional natural gasoline, but a plant of this type to process 3,000 bbl. per day of normal butane would cost approximately $17,000,000."

Scurry Hearing

Railroad Commission to hear production problems

AUSTIN. — Virtually all phases of the controversial question of regulating production of crude oil from the Canyon reef fields of Scurry County will be laid before the Texas Railroad Commission at a special hearing here November 3.

The commission's call for the hearing and its requests to operators for information indicate an intention to impose a rather sharp reduction in allowables and to set strict operating regulations. Commissioner William J. Murray, Jr., has said that present methods are recovering less than 20 per cent of the oil from the Canyon reef, and Jack Baumel, the commission's chief engineer, has suggested reducing Canyon reef allowables to 65 from 160 bbl. per day per well.

Producers from these fields will come to the hearing armed with a huge mass of engineering data designed in general to show that the fields are now being operated properly and that all possible steps are being taken to control or correct drop in bottom-hole pressure and encroachment of edge water.

Pressure survey. — The testimony to be presented at the hearing will include the results of the recent field-wide pressure survey, progress made on pressure-maintenance plans, whether the several Canyon reef fields in the region are connected and should be treated as a single field, whether all parts of the field should be produced at the same rate in spite of varying pressures, the proper MER for the field, lower allowables, the percentage of the field drilled and plans for future drilling, reduction of gas-oil and water-oil ratios, progress in constructing natural-gasoline plants, quantity of gas available for pressure maintenance, prospects for water injection, and similar aspects of reservoir engineering.

Manning Firm Sold

Fred M. Manning, Denver, has announced the sale of Fred M. Manning, Inc., to Malco Refineries, Inc., of Roswell, N. M. Consideration was not disclosed.

Manning properties in Texas, Oklahoma, Wyoming, and Colorado comprise 240 producing wells in Texas and Oklahoma, and 15 in Wyoming. Included in the transaction were 23 drilling rigs. Production from the 255 wells averages about 7,500 bbl. daily. Colorado holdings are undeveloped.

Manning's North-Central Texas properties included four pressure-maintenance plants, three of which are in Throckmorton County, and have an estimated 6,000-gal. combined daily output of natural gasoline.

Malco owns properties in Texas and New Mexico, which include a 2,500-bbl. skimming and cracking plant at Roswell, and approximately 75 miles of pipe lines in Eddy and Chaves counties, New Mexico.

For the present, Malco will continue operation of the new properties under the name of Fred M. Manning, Inc., maintaining its Fort Worth office and personnel.

Present plans of the new operators calls for immediate development of acreage in West and West-Central Texas, which will include the drilling of six new wells in the Fort Chadbourne area of Coke and Runnels counties, one in Dawson County, two each in Throckmorton and Eastland counties, and one each in Callahan and Shackelford counties.

Manning retained his personal holdings, including properties in Texas and the Rocky Mountain area.

Elk City to Be Unitized

OKLAHOMA CITY.—The Oklahoma Corporation Commission has approved unitization of the Hoxbar-conglomerate producing zone of Elk City field in Beckham and Washita counties, Oklahoma, with Shell Oil Co., discoverer of the field, as the unit operator.

Under state law the unit program becomes effective within 60 days, or on January 1, unless there is protest by 15 per cent of the leaseholders.

The original order will cover 81 wells, each on a 40-acre unit, although there are 99 producers in the field at this time.

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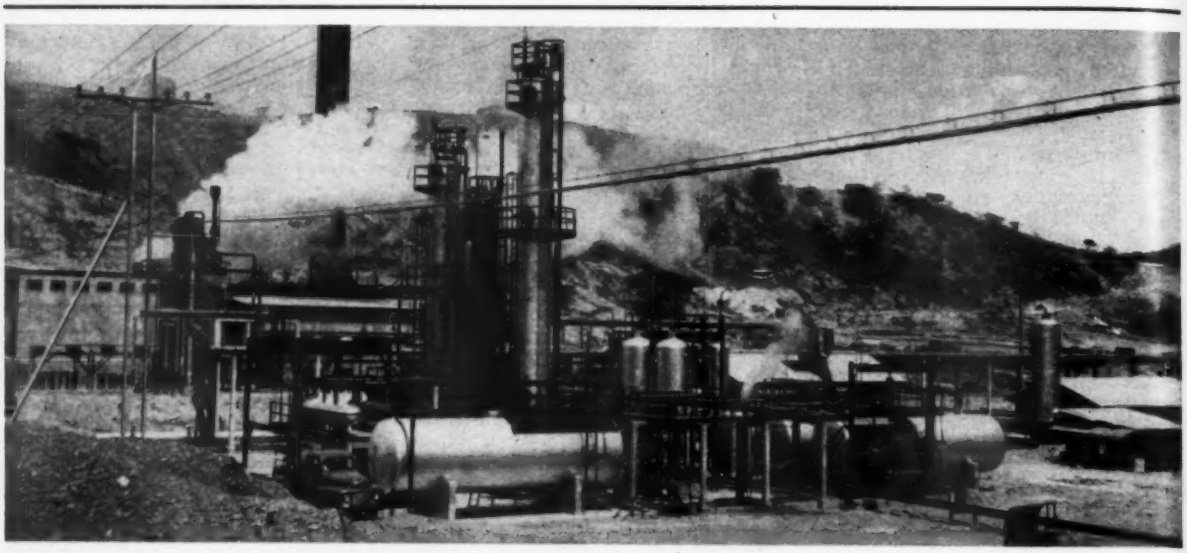


The main refining units at Sinclair Oil & Refining Co.'s Puerto La Cruz, Venezuela, plant. Heater is at right, and fractionating column is at left. The refinery, with a daily capacity of 35,000 bbl., was dedicated by company and government officials on October 21.

LATIN AMERICA

Venezuelan Optimism

There's a note of caution and a few trouble spots, but operators look for continued increase in oil activity

Dahl M. Duff

AFTER 5 months of virtually all-out production, oil men in Venezuela are showing a certain cautious optimism over the outlook for their industry.

There is a general expectation that drilling and exploration work will be increased considerably next year in order to keep abreast of the current record production rate. Talk of 120 to 130 rigs running in contrast to the present 90 is heard in Caracas.

Supplies of pipe and other equipment held by the major operators are tightening up. Some of the larger operators will reenter the market in coming months. This reverses the situation a year ago when various companies were selling off surplus stocks.

Relations between the government and the companies appear to be excellent. The present military regime is praised in the industry for its fairness and its stabilizing influence in the country. Government leaders realize how completely dependent is the country's economy on the welfare of the industry.

Any predictions about the future of the industry in Venezuela are, however, made subject to a number of qualifications. Among both government and company officials, the memory of the precipitous slump 2 years ago is too recent to allow any positive statements. What happened at the end of 1948 impressed almost everyone connected with the Venezuelan oil industry the fact that the market controls the level of operations and that the fluctuations can be extremely sharp in an almost wholly exporting country.

External factors.—These are some of the impressions received in a brief visit through eastern Venezuela and to Caracas. Even on the wholly operating level, oil men in Venezuela are acutely aware of the effect on their work of such external factors as the import controversy in the United States, the weather this winter on the East Coast, and the emergence of Canada as a major producing country.

In Caracas, the report was that pipe which formerly could be obtained on 60-day order now takes 6 months or more. One major producer was said to be planning to add up to 10 rigs in its program next year but that this had been made doubtful by uncertain pipe deliveries. In eastern Venezuela, a field superintendent commented that where formerly he could borrow or buy what he needed from neighboring companies little could now be obtained except on promise of early return.

Record output. — Venezuela's record production has brought all the companies up to or near their limit, if not of field potential then the capacity to move and deliver oil from the Caribbean terminals. If market demand continues to increase, stepped-up drilling will be necessary to obtain the additional production. In the week ended October 9, the Venezuelan industry marked up another of the succession of production records with 1,614,831 bbl. daily. In August, Venezuela's total potential was estimated at 1,618,385 bbl. daily.

Before the sharp decline late in 1948, as a result of the break in the heavy fuel market in the eastern United States, a total of more than 150 rigs were in operation in Venezuela. By March of this year, the total had dropped to less than 80. The trend is now upward and is expected to continue up, but there is no feeling that it will regain the high level of 1948.

In Caracas, a top official of a major Venezuelan company said his organization was planning to put back in service some of the rigs stacked last year. But he emphasized that there was no intention of instituting any inflated or overly large drilling program that might lead to such drastic cutbacks as occurred late in 1948 and in 1949.

These reductions with widespread layoffs of the labor force obviously affect the economy of Venezuela much more than they would in the United States. In Venezuela, this official said, it is desirable to iron out as far as possible the peaks and valleys of industry operation.

Several discoveries.—In eastern Venezuela, there have been several discoveries this year, and the opinion was frequently heard that there are many more fields yet to be found throughout this area. Considerable importance is being attached to the Guere discovery of Sinclair Oil & Refining Co.

The well, which tested 1,276 bbl. daily on a ⅜-in. choke from about 7,885 ft., may open up an entire new trend north of the fault in the area west of Anaco. Mene Grande Oil Co. has had two discoveries in eastern Venezuela, one at Los Monos southeast of Guere and another shallow well, La Vieja, in Anzoategui west of Santa Barbara.

In western Venezuela, Creole Petroleum Corp.'s Alturitas well, which went to 17,039 ft., has been completed to produce from around 11,000 ft. This well holds the distinction of being the deepest ever drilled outside the United States. Reflecting the expected pickup of activity in western Venezuela, Creole is planning to place back in service its large electric drilling barge, the so-called Queen Mary. The barge was built 3 years ago for use in Lake Maracaibo, but with the decline in activity it was employed for only one well.

Iron developments.—The work of developing Venezuela's large iron-ore deposits on the Orinoco River is being followed with interest by the oil industry. The programs being carried out on the concessions of United States Steel and Bethlehem may give some much-needed diversification to the Venezuelan economy. Both the oil industry and government leaders recognize the danger of a "one crop" economy.

The iron-ore development also is important to the Venezuelan petroleum industry in that it offers a possibility for utilization of much now-flared natural gas. It was reported in Caracas that some of the initial shipments being made by Bethlehem are going to Sweden for tests in connection with gas reduction. What is ultimately hoped for is a gas pipe line from eastern Venezuela fields south to the iron-ore development on the Orinoco. Gas also could be used for the Venezuelan Gulf and Sinclair refineries at Puerto La Cruz and by the industries in this area.

Want gas used.—Oil officials in the Venezuelan Government are keenly anxious to see the operating companies utilize as much of the oil-well gas as possible. The gas-conservation efforts of the Texas Railroad Commission are closely followed, and the construction of gas-repressuring plants is encouraged. The latest project in this field is the natural-gasoline and pressure-maintenance plant reportedly planned by Phillips Oil Co. in its new San Roque area in eastern Venezuela. Phillips also is to build an 8,000-bbl. wax refinery to use San Roque crude.

An official of the hydrocarbons bureau of the Ministry of Fomento pointed out that at present some 86 per cent of all the gas produced in Venezuela is wasted. He said it had been shown that carbon-black plants erected in Venezuela could not compete in world markets with the production from the United States, but added that fertilizer plants using natural gas might be feasible. There is some demand for fertilizer in Venezuela itself.

Lack of markets.—The principal difficulty with gas utilization in Venezuela is, of course, the lack of a large domestic and industrial market to support transmission lines. Aside from the Caracas-Valencia market, the most likely outlet for Venezuelan gas appears to be in industrial projects such as for iron-ore reduction and in oil-field repressuring.

Work is expected to start in December on the transmission line to be built from central Venezuela to Caracas and Valencia. The company is Venezuelan Atlantic Transmission Corp., backed by Atlantic Refining Co., E. Holley Poe, and local Venezuelan capital. Some pipe from France is to be received for the line. First deliveries from the $6,500,000 system are scheduled the middle of next year.

Whether the present government will resume granting oil concessions is still a subject for some discussion. No new concessions have been awarded in the country since 1944. It is understood that the commission appointed last year to study a national oil policy has recommended that concessions again be granted. However, no action is anticipated at any time in the near future, if then.

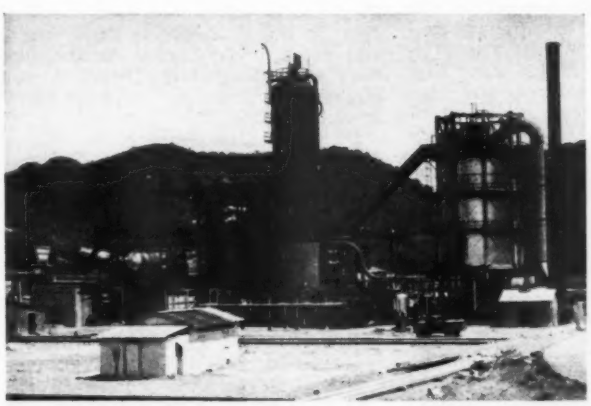
"Bullish" trend.—Some feel that the government lost its best opportunity to grant concessions when it failed to act during the exploration boom in 1948. The present policy leads to intensive development of existing areas, and if the present somewhat bullish trend continues, concession offerings later would surely result in heavy bids. Several new companies, including Cities Service, Conorado, and Superior, are seeking to enter Venezuela.

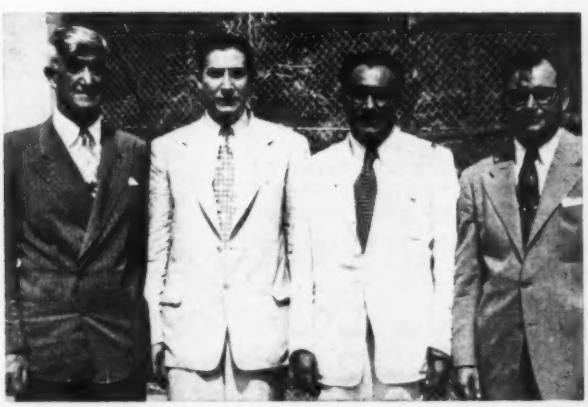
There has been no announced settlement as yet of the differences between the companies and the government over the royalty price for heavy oil. It is expected that some amicable agreement will be reached tying this into the market price for heavy fuel oil rather than the less flexible base of Texas crude prices.

I.P.C. Permit Extended

A recent decree of the Peruvian Government has extended the exploration authorization granted International Petroleum Co., Ltd., last July.

The company is now able to carry out exploration work over a large area of northern Peru. The govern-





Left: The treating plant at the refinery. Right: Among the government officials attending the dedication ceremony was Dr. Manuel R. Egana, minister of Fomento. In the group are, left to right: Willis S. Gullette, from Sinclair's East Chicago refinery, who directed construction of the Puerto La Cruz plant; Edward L. Steiniger, president, Venezuelan Petroleum Co.; Dr. Egana; and E. T. Lincoln, superintendent of the new refinery.

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ment permit is for a term of 2 years, expiring September 15, 1952. The government Department of Petroleum Works will supervise operations through its technical services.

International, at present the principal producer in Peru from its fee-owned La Brea-Parina estate, is one of three companies exploring in Peru in the hope of favorable government action on new petroleum legislation. Conorado Petroleum Corp. and Standard Oil Co. of California also have parties in the field.

AFRICA

Company Formed

Plant will be built to make petrol from coal

SOUTH AFRICA'S plans to synthesize liquid petroleum products from coal have advanced another step with the registration of a new company, South African Coal, Oil & Gas Corp. in Pretoria.

The project has been in the planning stage on the part of Anglo-Transvaal Consolidated Investment Co. for some 15 years. In November 1948 the government granted a coal-to-oil manufacturing license to Anglo-Transvaal acting as trustee for a company at that time yet to be formed.

In Johannesburg, Dr. H. J. van Eck, vice chairman of the new company, said recently that private contractors would be invited to bid on erection of various sections of the plant, including oxygen manufacture, gasification, synthesis, and oil-treatment units, boiler houses, and other units. The government is backing the venture through the Industrial Development Corp., guaranteeing up to £13,000,000 (equivalent to $36,400,000). However, more than £20,000,000 is expected to be needed to reach large-scale production.

A choice of sites for the plant is now under consideration. The coal to be used is that from the Vredefort district. According to the chairman of the new company, P. E. Rousseau, specimens of South African coal are being sent outside the country for testing by possible contractors. Production from the plant is not likely for at least 3 years; initial output will include about 1,000,000 bbl. of gasoline a year.

Sees competitive basis.—Dr. van Eck stated that his belief was that "in the Union's interior, taking into account the present price of petrol, the manufacture of petrol from coal could be achieved on a competitive basis." Dr. van Eck also is chairman of the Industrial Development Corp. The entire project is being carried forward under close government supervision. The 1948 license provides a majority of directors at all times must be Union nationals, and that 30 per cent is to be allocated to the producer, with the remainder going into a special adjustment fund to be used to effect price reductions.

Sinclair Case Dismissed

NEW YORK.—The Appellate Division of the Supreme Court of New York has granted a motion by Sinclair Oil Corp. to dismiss the complaint in an action brought by Leo Y. Chertok, New York, against the company and others claiming damages totaling $5,000,000.

Chertok alleged that the Ethiopian Government in 1935 entered into an agreement with him relating to an oil concession in the country and that Sinclair induced the Ethiopian Government to breach this agreement before Sinclair received its Ethiopian concession. As a result of the court's action, a judgment will be entered in favor of Sinclair Oil Corp. and Sinclair Petroleum Co., its operating subsidiary in Ethiopia.

Pipe-Line Route Surveyed

A survey party is now working in Portuguese East Africa studying the route for a products pipe line which would extend inland to serve Southern Rhodesia.

This was revealed recently in Salisbury, Southern Rhodesia, by the minister of transport and economic development of the British colony. The line would extend some 200 miles across difficult country from Beira, in Portuguese Mozambique, to 3,750 ft. elevation at Umtali in Southern Rhodesia.

Negotiations have been under way for some time with the Portuguese who have agreed to cooperate in the undertaking. The Government of Southern Rhodesia considers the project to be of urgent importance since a shortage of gasoline has been hampering the country.

The Rhodesian line, presumably to be built by the government, is one of several planned or already constructed into inland Africa. The British built a line to serve their East African peanut-oil scheme, and several companies are working on plans for a new 225-mile line to Leopoldville in the Belgian Congo. *(The Oil and Gas Journal, October 26, 1950, page 66).*

FAR EAST

Chinese Exploration Starts

Joint Russian - Chinese companies have been organized to carry out exploration and development for petroleum and nonferrous metals in the Chinese border province of Sinkiang.

According to the Chinese Communists' Peking Radio, the mixed joint-stock company dealing with petroleum will explore for, produce, and refine oil in the province. Organization of the companies follow negotiations undertaken after a Soviet - Chinese agreement on the matter last March.

Sinkiang in central Asia north of Tibet is across the border from the Kirgiz region of Russia where the Soviets have a number of fields. According to the announcement, the Russians and the Chinese will divide the investment and the profits with half the employes Russian and half Chinese. Similar joint oil companies have been set up in the Communist satellites of Eastern Europe.

EUROPE

Portuguese Test at 3,500 Ft.

The wildcat test which Cia. do Petroleo de Portugal is drilling about 30 miles northeast of Lisbon is reported to have reached approximately 3,500 ft.

The company, which has an ownership about equally divided between the Portuguese Government and Swedish interests, is being assisted in its program by Exploration Contractors, Inc., New York. It holds concession rights on scattered areas comprising about a fourth of Portugal.

The well, being drilled with a German rig, was shut down for about 2½ months recently because of mechanical difficulties. Seismograph work is being continued in other areas.

Austria Activity to Rise

WASHINGTON. — Exploration for petroleum in Upper Austria will soon be stepped up, it was reported here last week through the Austrian Consulate General.

The search for oil in this area was begun in 1948 by the Rohoel-Gewinnungs, A.G. at the request of the federal geological service, and to date 60 drillings have been made in the Bad Hall area between the Salzach and Mattig rivers with results that have strengthened the belief in oil circles that important deposits exist at great depths.

Drilling is also expected to be undertaken in the Graz basin, an area presumed to be rich in petroleum deposits, it was reported.

British Tankers Ordered

Standard Oil Co. (N. J.) has placed an order in England for the construction of two 26,500-ton tankers, utilizing sterling accumulated under the currency agreements reached earlier this year between the company and the British Government.

The tankers will be built by Vickers-Armstrong, Ltd., at its yard in Barrow-in-Furness, Lancashire.

Shell Veteran

Galloway has been with firm for past 24 years

ALAN JAMES GALLOWAY, vice president in charge of exploration and production for Shell Oil Co., has spent his entire career with Shell and has held a vice presidency for the past 16 years.

Galloway, who was born in London and educated at Cambridge University, received his B.A. and M.A. degrees in Natural Sciences.

In 1926, he joined Shell as an assistant geologist in Los Angeles, and in December 1928, was transferred to San Francisco as an assistant in the president's office, a position he held until 1934.

He became vice president in Shell's office in St. Louis in 1934, and during the next 6 years, was in charge, at different times, of Shell's production and exploration operations in the Mid-Continent area, in the Texas-Gulf area, and in the head office at St. Louis. In 1940, when Shell's head office for the East-of-the-Rockies territory was moved from St. Louis to New York, he moved back to Houston in charge of all exploration and production activities east of the Rockies.

After 8 years in Houston, Galloway moved to New York in 1948 as vice president in charge of nation-wide exploration and production for Shell.

Presley E. Vinson, independent oil operator at Houston, has joined Amerada Petroleum Corp. as district landman.

William B. Retallick, formerly chemical engineer for Phillips Petroleum Co. at Bartlesville, Okla., is now engaged in research work at the University of Illinois.

Norman G. Kittrell, petroleum engineer for The Texas Co., has been transferred from Seguin to Liberty, Tex., in the same capacity.

Roy Floyd, division superintendent for Shell Pipe Line Co., has been transferred from Arkansas City, Kans., to Cushing, Okla., in that position.

Joseph R. Ault, engineer for Carter Oil Co., has been transferred from Vicksburg, Miss., to Monroe, La.

Charles N. Copenhaver, drilling superintendent for Brown Drilling Co., has been transferred from Lawndale, Calif., to Rio Vista, Calif., in the same capacity.

Don D. Baremore, tool pusher for Sharp Drilling Co., has been transferred from Snyder, Tex., to Big Spring, Tex.

Edward I. Blincoe, engineer for Sohio Petroleum Co., has been transferred from Oklahoma City to Houston as general petroleum engineer, and **Claud A. Keller,** production foreman at Oklahoma City, has been named assistant district superintendent of operations for the West Edmond Hunton Lime Unit.

Roy A. Baze, district petroleum engineer for Humble Oil & Refining Co., has been transferred from Corpus Christi to Raymondville, Tex., in that capacity.

William H. Dyer, engineer at Hobbs, N. M., for Warren Petroleum Corp., has been transferred to Maysville, Okla., as plant chemist engaged in testing products and controlling plant operations. **E. F. Jernigan,** chemist at Maysville, Okla., has been transferred to the Tulsa liquefied-petroleum-gas division.

F. H. Rathjen has been named plant superintendent of the gasoline plant at Elk City, Okla., for Shell Oil Co. For the past 2 years he has been on an assignment in Venezuela.

J. W. Zoller has been named district exploitation engineer for Shell Oil Co., and transferred from Elk City to Ardmore, Okla. Other transfers include: **B. W. Weinland,** from Houston to Centralia, Ill., as mechanical engineer; **Frank Poorman, Jr.,** from Houston to the Oklahoma mechanical-engineering division; **W. C. Gussow,** from the Oklahoma exploration division to the Midland, Tex., area; **A. E. Cordray,** from Ardmore to the exploitation engineering area at Tulsa; **T. C. Bonner,** from the Tonkawa, Okla., plant to the Elk City gas plant as shift foreman; **R. F. Wicks,** from Elk City to Great Bend, Kans., as assistant district superintendent; **J. D. Boswell,** from the Oklahoma production division to New Orleans; **F. T. Connolly,** from the Houston geological training program to the Oklahoma exploration division as subsurface geologist; **L. W. Stoesz,** from the Houston geological-training program to the Denver district as seismologist on Exploration Party 120; **S. G. Stiles,** to Tulsa from California as mechanical engineer; **W. F. Taylor,** Illinois production division, named district foreman; **F. R. Versaw,** from Tulsa to the Denver district as district geophysicist; **L. J. Hays,** from the Oklahoma City production division to Ardmore as district mechanical engineer; **T. P. McCann,** from the Houston geological-training program to Tulsa as subsurface geologist; **R. M. Stevens,** from the Houston staff to the North Texas exploitation engineering division; and **G. C. Bankston,** from Houston to the Elk City staff as exploitation engineer.

Emery T. Clark, formerly secretary of Petco Corp., Milwaukee, owner and operator of Great Lakes Refining Co., has been elected president and chairman of the board of directors. Other changes include: **John S. Stackner,** elected treasurer and appointed general manager; **John A. Crawford,** elected vice president and named general manager of refineries; **Edwin H. Brown,** formerly controller of Great Lakes Refining, appointed controller of Petco; **Wayne E. Hendricks,** formerly assistant controller of Great Lakes Refining, appointed general auditor of all refining and wholesale divisions; and **Donald J. Schreiber,** formerly controller of Petco, elected to the board as secretary.

W. E. Fremgen, chemical engineer for Lago Oil & Transport Co., Ltd., has been transferred from Brownville, Tex., to Aruba, N.W.I.

J. M. Duncan, tool pusher for Noble Drilling Corp., has been transferred from Duncan, Okla., to Craig, Colo.

C. B. Smith, Jr., seismograph party chief for Continental Oil Co. at Hamlin, Tex., has been transferred as party chief to McCamey, Tex.

Harry T. Klein, president of The Texas Co., and **W. S. S. Rodgers,** chairman of the board, recently made a tour through Texas, inspecting company properties and facilities. Others who accompanied them were: **J. S. Leach,** executive vice president; **R. F.**

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PERSONALS

Baker, vice president; **M. Halpern,** vice president; **A. C. Long,** vice president; **R. Ogarrio,** vice president; **R. L. Saunders,** vice president; **W. G. Elicker,** secretary; and **J. H. Pipkin,** general manager of industrial and public relations; and the following directors; **George N. Aldredge,** Dallas; **W. J. Cummings,** Chicago; **W. S. Gray** and **Henry U. Harris,** New York; **J. H. Lapham,** San Antonio, Tex.; **C. L. McCune,** Pittsburgh; and **W. H. Mitchell,** Chicago.

H. D. Drummond has been named foreman in the refining division of Esso Standard Oil Co.'s Baton Rouge refinery, and **J. E. Martinez, Jr.,** has been named foreman in the cracking coils department.

Larry Finfrock, who has been with Carter Oil Co. at Jackson, Miss., has joined Sunray Oil Corp. there.

Robert B. Brinkerhoff, University of Texas graduate, has joined American Republics Corp. as a petroleum engineer in the Silsbee, Tex., district.

Joe H. Bell, Jr., recent graduate of Oklahoma A. & M. College, has joined Tide Water Associated Oil Co. as engineer at the Drumright, Okla., refinery. **Lynn A. Brown,** 1950 graduate from the Colorado School of Mines, has joined Tide Water's Midland, Tex., office as junior geologist. **Roy L. Moore,** foreman, has been transferred from the field office at Odessa, Tex., to Long Lake, Tex., and **William D. Dobbs** has been transferred as foreman to Odessa from Long Lake.

O. R. Leonard has been named to supervise the newly created chemical testing group at Esso Standard Oil Co.'s Baton Rouge refinery, and **H. E. Westbrook** has been named supervisor of the analytical group. **C. K. Heltzel** has been assigned to the analytical group as chemist to handle special analytical problems, and **G. F. Ullrich,** formerly of petroleum technical service, has been transferred to the laboratory to carry out special studies in the planning of laboratory work.

James A. Roy has joined the Salt Lake City staff of Sinclair Oil & Gas Co. as a geologist. He formerly lived in Denver.

John C. Harper, formerly research engineer for California Research Corp. at La Habra, Calif., has joined the department of engineering at the University of California, Los Angeles, as an associate professor.

Don K. Spellman, Jr., petroleum engineer for Ohio Oil Co., has been transferred from Houston to Midland, Tex., as district petroleum engineer. He replaces **D. V. Kitley,** who has entered the armed services. Other changes include: **E. Paul Ward,** Houston division petroleum engineer, transferred to the Findlay, Ohio, office on temporary basis; **Louis H. Shearer,** named to replace Ward; and **James B. Tartt,** geologist, transferred from Roswell, N. M., to Houston.

Thomas G. Fields has been appointed district secretary of the Liquefied Petroleum Gas Association's newly created southeastern district in Atlanta, which will serve the states of Alabama, Florida, North Carolina, and South Carolina.

Jack Brown, formerly vice president of Penguin Petroleum, Inc., has sold his interest in the company to **W. G. Talbott,** who is now sole owner. Brown will continue his activity in the oil business as a consulting geologist and in the development of properties.

B. C. Pruet has been made Rocky Mountain division scout for Lion Oil Co. with headquarters in Casper, Wyo. He replaces **Tom Clifton** who has been transferred to Denver as landman.

A. C. Rubel, vice president in charge of exploration and production of Union Oil Co., has been elected a director of Lane-Wells Co.

Tyler A. Ferguson, division engineer for Transcontinental Gas Pipe Line Corp., has been transferred from Opelousas, La., to Atlanta, Ga.

D. H. Bingham, consulting geologist formerly with Phillips Petroleum Co. and Shell Oil Co., has established offices in Lafayette, La.

Gayle P. Crawford, Stanolind Oil & Gas Co., has been named assistant district geologist of the West Texas-New Mexico district with offices at Midland, Tex. **Nugent T. Brasher, Charles R. Barr, Raymond A. Diemer,** and **Jack A. Menish** were named area geologists. Brasher will be area geologist for the north area of the West Texas-New Mexico district; Barr for the east area; Diemer will be in charge of the west area; and Menish the south area.

Wayne I. Boren, J. R. Burckhalter, Ora McIntyre, M. R. Thomason, George F. Schuman, J. E. Eli, and **C. H. Williams,** employes of Sinclair Oil refinery at Sinclair, Wyo., have been transferred to the plant at Puerto La Cruz, Venezuela.

H. Gardner Symonds, Houston, president of Tennessee Gas Transmission Corp., has been elected to the board of trustees of Smith College, Northampton, Mass.

Dan W. McCauley, formerly chief geologist for Tennessee Gas Transmission Corp., and Sterling Oil & Refining Co., has opened consulting offices in Houston.

Irving L. Snider, geologist for Atlantic Refining Co., Jackson, Miss., has been transferred to Wichita in a similar capacity.

A.A.P.G. OFFICERS.—Newly elected officers of the Pacific section, American Association of Petroleum Geologists. Left to right: Jack Knight, British-American Oil Producing Co., secretary-treasurer; Frank Carter, General Petroleum Corp., president; and Frank Parker, Signal Oil & Gas Co., vice president.

PERSONALS

Francis M. Lehner has been transferred from Shell Oil Co.'s Santa Ana offices in southern California, as junior seismologist, to the Bakersfield offices, San Joaquin division.

WILLIAM NADEN

H. P. SCHOECK

William Naden has been appointed a vice president of Esso Standard Oil Co., and **Herbert P. Schoeck** has been appointed a director. The appointments follow the resignation of **Marion W. Boyer,** a vice president and director who has accepted the post of general manager with the Atomic Energy Commission. Naden, who joined the company 20 years ago as a chemist at the Everett, Mass., refinery is presently a director and general manager of manufacturing. Schoeck started with Esso 33 years ago as an office boy and clerk and has been treasurer of the company since 1944.

D. Y. Hewitt has been named president of Leonard Pipe Line Co., and **John J. Devine** has been named vice president. Hewitt, who has been associated with the oil industry for 20 years, joined Leonard in 1948 as executive vice president. Devine, who has been with the company since 1938 and general manager since 1948, will continue as general manager along with the vice presidency. Other officers include: **J. Walter Leonard,** who continues as chairman of the board; **Grant L. Cook,** Detroit, secretary-treasurer; **F. M. McClean,** assistant secretary; and **Robert Lyle,** assistant treasurer. Stockholders elected the following directors for the 1950-51 year: Leonard, Hewitt, Devine, Cook, and **Bernard M. Jones.**

D. Y. HEWITT

O. D. Donnell, former president and general manager of Ohio Oil Co., will be awarded a Certificate of Appreciation by the division of production of the American Petroleum Institute at the annual meeting in Los Angeles on November 13-16. Others receiving certificates will be: **Walter Samans,** formerly with Sun Oil Co., Philadelphia; **C. P. Dimit,** vice president of the production department for Phillips Petroleum Co., Bartlesville; **John A. Ritter,** Sun Oil Co., Dallas; **J. C. Siegle,** Youngstown Sheet & Tube Co., Youngstown, Ohio; **Paul D. Torrey,** president of Lynes, Inc., Houston; **D. L. Trax,** Gulf Oil Corp., Tulsa; the late George S. Bays, formerly with Stanolind Oil & Gas Co., Tulsa; and **J. Jay Dunn,** of Ellwood City, Pa., formerly with the National Tube Co.

Harry D. Aggers, formerly foreman for Union Oil Co. in Dominguez area of southern California, has been named superintendent of the San Joaquin Valley division with headquarters in Bakersfield. He succeeds **K. C. Vaughn,** who has been named manager of California field operations at Union's Los Angeles offices.

Dr. Daniel P. Barnard IV, research coordinator for Standard Oil Co. (Ind.), will receive the 1949 Horning Memorial Award at the January 1951 annual meeting of the Society of Automotive Engineers in Detroit, in recognition of distinguished active service in the field of mutual adaptation of fuels and engines. He is president and a director of the Coordinating Research Council, and is also chairman of the automotive research committee of the American Petroleum Institute, Division of Refining.

David H. Sears, geologist for Shell Oil Co., has been transferred from Santa Ana, Calif., to Paso Robles, Calif.

I.N.G.A.A. PRESIDENT.—Paul Kayser, right, president of El Paso Natural Gas Co., Houston, receives congratulations from Clyde H. Alexander, Dallas, outgoing president of the Independent Natural Gas Association of America. Kayser was named president at the association's recent Houston meeting.

G. Clifton Bomhardt has been named to head a new process-department group at Esso Standard Oil Co.'s Baltimore refinery, termed the Asphalt Manufacturing and Intraplant Oil Movement and Storage Group. The new assistant general foreman of the group is **Anthony J. DeGennaro.** At the same plant **R. E. Darley** has been named to head another newly formed department on grease and specialties, and **Ernest H. Peterson** heads another new division, termed the process and stock coordination group now part of the process department.

Richard Dorst has been appointed West Coast secretary of the Liquefied Petroleum Gas Association, succeeding **K. B. Jacobsen.**

Carl O. Petersen of Tide Water Associated Oil Co., has been named safety engineer at the company's Bayonne, N. J., refinery.

DEATHS

Dillon Alva Little, 63, retired president of Magnolia Petroleum Co. and Magnolia Pipeline Co., died in Dallas October 26. A native of Corsicana, Tex., Little joined the company in 1914, and served in various capacities. He was elected a vice president in 1930, and to the office of president in 1933. Little retired in 1946 due to ill health. He was the first president of the Dallas Petroleum Club.

Walter E. Routt, 54, president of Houston Mud & Chemical Co., died October 24.

Fred S. Cannan, assistant advertising manager for Sun Oil Co., died October 24 in Philadelphia.

Walter March Burress, 57, petroleum geologist, died recently in Tyler, Tex.

J. Ralph Davis, 52, personnel manager for Gulf Oil Corp. refinery, died October 21 in Port Arthur, Tex.

Angus Edward Southerland, 79, driller for Imperial Oil Co., Ltd., died recently at Petrolia, Ont., Canada.

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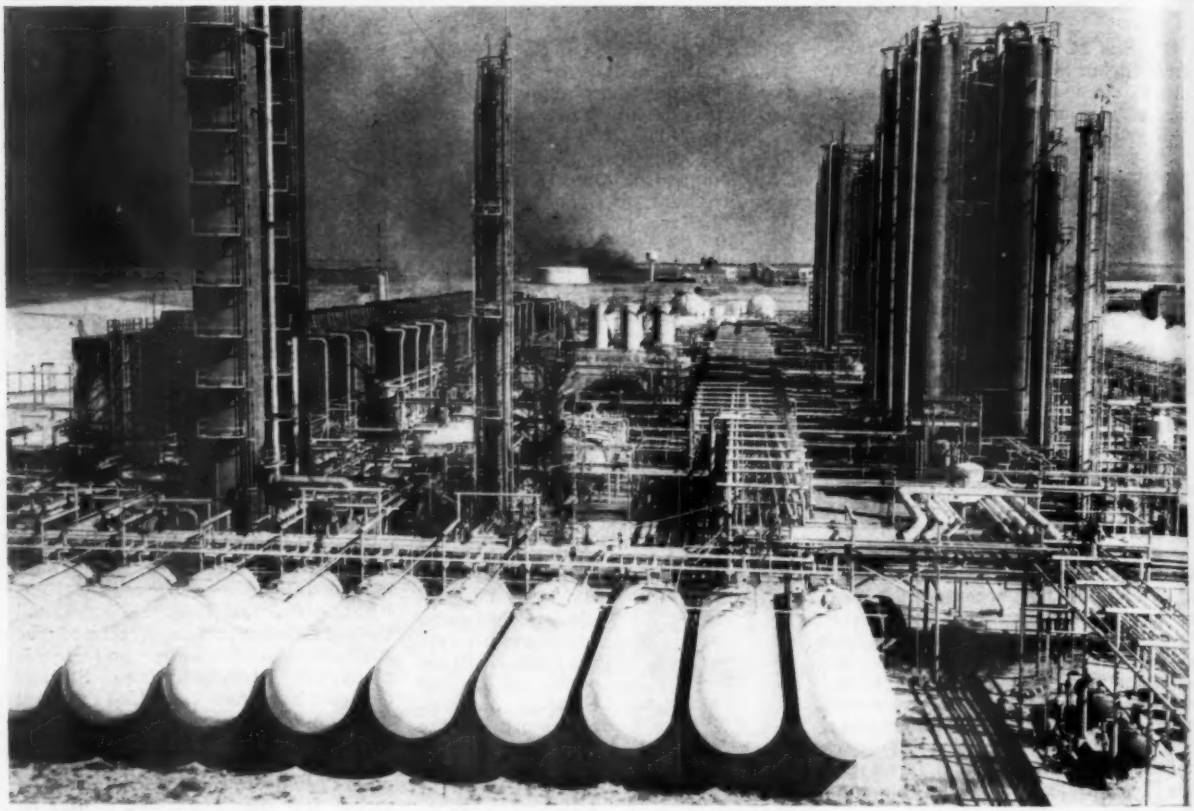


BORGER, TEX.—Fractionation area of Phillips Chemical Co.'s Plains plant, with government-owned copolymer plant in background.

MAGIC OF PETROCHEMISTRY OPENS

Here is a special staff survey, by Journal editors in Tulsa, New York, Houston, Dallas, and Los Angeles, on companies active in this expanding industry; who and where they are, what they make, and how they are enlarging their facilities to keep abreast of expanding markets.

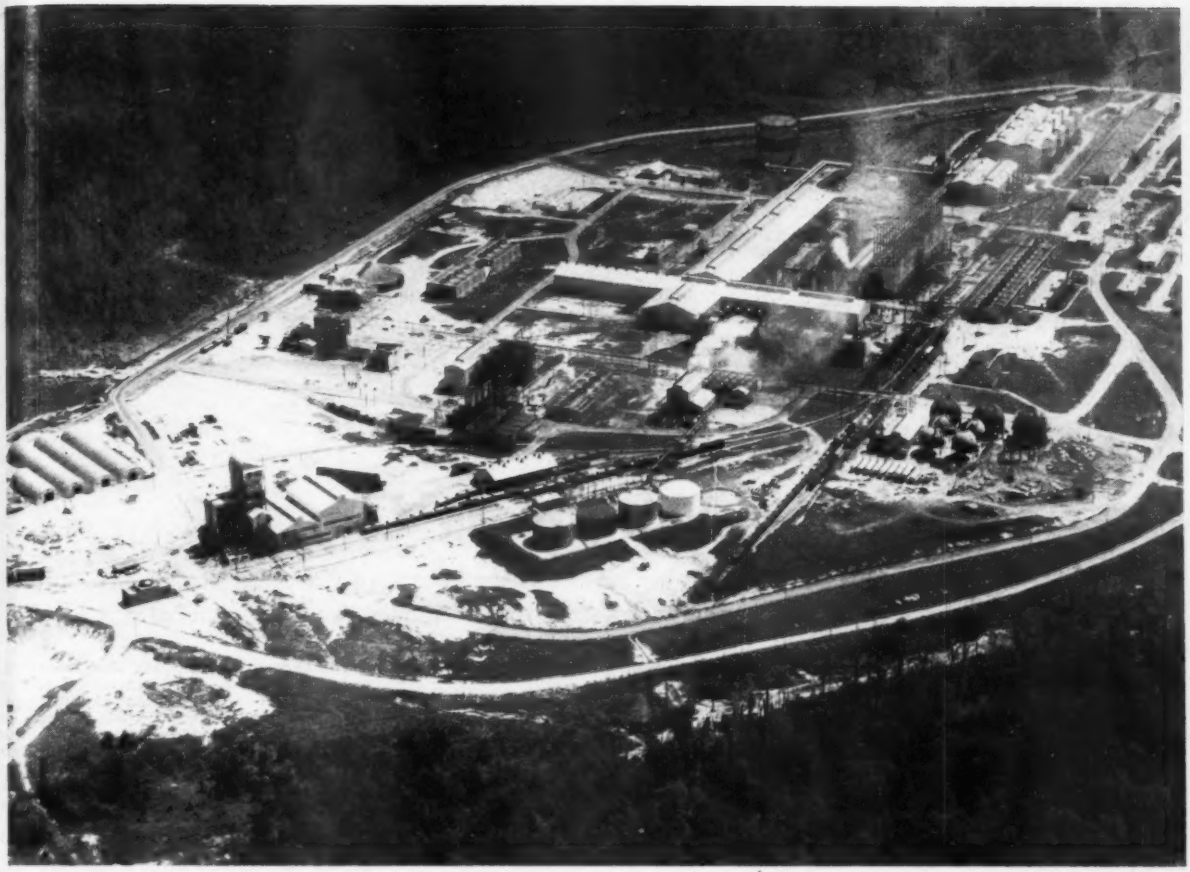
When most people think of oil-industry products, gasoline, lubricants, and fuel oils usually come to mind. But not so for those acquainted with the new technology of petrochemistry.

Today our industry is manufacturing a large number of different alcohols, glycols, ketones, and other important chemical intermediates from petroleum. And also large quantities of synthetic rubber.

From petroleum now comes glycerin, which goes into paints and varnishes, cellophane, explosives, and even into tobacco to make it moist and cool smoking. This petroleum-derived glycerin also finds its way into many cosmetic products.

Huge tonnages of petrochemicals are being manufactured and consumed in this country. This year the estimated production of chemicals based on petroleum and natural gas is on the order of 12 billion pounds.

Taking the Gulf Coast area only, the value of petrochemical plants prewar was $65,000,000. About $1,000,000,000 was invested in plants during the war. And since that time some $300,000,000 has been invested by private concerns, with $250,000,000 more earmarked for projects.



EL DORADO, ARK.—Lion Oil Co.'s chemical plant makes nitrogen products at annual rate of 160,000 tons, from natural gas, air, and water.

NEW HORIZONS FOR OIL AND GAS

Phillips Chemical Co.

Wide variety of products produced at plants in Etter, Borger, Houston, Tex.

PHILLIPS CHEMICAL CO., a wholly owned subsidiary of Phillips Petroleum Co., is one of the country's leading chemical manufacturers, producing anhydrous ammonia, nitrogenous fertilizers, and furnace-type blacks. In addition, it operates synthetic-rubber facilities owned by the Government.

Anhydrous ammonia, ammonium nitrate, and nitrogen solutions are manufactured at the company's Cactus plant in the Texas Panhandle, under which lies one of the world's largest known gas fields. Ammonium sulfate is processed at Adams Terminal near Houston.

Etter, Tex., Plants

Ammonia plant.—This plant has design capacity of 154,000 tons per year. Raw gas, after being desulfurized, is reacted with air forming nitrogen, hydrogen, and the oxides of carbon. After removing carbon monoxide and carbon dioxide, the nitrogen and hydrogen are reacted catalytically at elevated pressures and temperatures to form ammonia, and the resulting effluent stream is purified with the unreacted H_2 and N_2 being returned to the system for reuse. Part of the anhydrous ammonia is then distributed to consumers for either direct or aqueous application to the soil or for refrigeration and other industrial uses and the remainder is further processed into nitric acid, ammonium nitrate, nitrogen solutions, and ammonium sulfate.

Nitric acid plant.—Nitric acid is produced by the conventional process of passing ammonia and air over a platinum gauze catalyst at elevated temperautres to form the oxides of nitrogen which are then mixed with water to make nitric acid.

Ammonium nitrate and nitrogen solutions.—These plants are of 100,000 and 20,000 tons per year design capacity, respectively. The acid is further mixed with ammonia to form an ammonium nitrate solution and the solution is then concentrated at reduced pressures. The concentrated solution (95 per cent) is sprayed into the top of an aluminum tower and becomes solidified by falling through an updraft of hot dry air. The solidified product (prills) is run through dryers, cooled, coated with clay for free flowing benefit, and bagged for distribution domestically.

Part of the dilute ammonium nitrate solution is blended with ammonia and water in specific proportions to produce nitrogen solutions which are shipped by tank car for direct appli-

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cation to the soil, or for use in mixed fertilizers.

Houston Operation

Terminal sulfate plant.—Ammonium sulfate is manufactured at the company's Adams Terminal plant (250,000 tons per year design capacity) located on the Houston Ship Channel near Houston. Ammonia from the Cactus plant at Etter and sulfuric acid manufactured from the sulfur deposits of South Texas are added to a mother liquor forming a supersaturated solution within which ammonium sulfate seeds form and grow as they fall to the bottom of the saturator. The crystals and mother liquor are pumped through centrifuges, where they are separated, with the mother liquor returning to the saturator and the crystals passing on to the dryers. From the dryers, part of the product is bagged for domestic and foreign sales, with the remainder being warehoused as bulk for export orders.

Borger, Tex., Facilities

When the supply of natural rubber was cut off after World War II began, it became imperative that synthetic rubber be produced for our Armed Forces and war workers at home. Prior to the war, Phillips' research had perfected and developed an economical process for producing butadiene, an essential ingredient of synthetic rubber.

In 1943 a Government-owned plant (Plains plant) near Borger, Tex., using this process, began producing butadiene (rated capacity of the plant is 56,200 tons per year). During and following the war years Phillips continued its research in finding and developing quality improvements in synthetic rubber. In 1947 the so-called "cold rubber" formula was announced.

A large amount of American rubber today is made with the "cold" recipe since it is acknowledged to be superior to natural rubber for tire treads and many other rubber products.

Plains butadiene plant.—Butane is hydrogenated at elevated temperatures to butylenes, which are concentrated in a series of fractionating and extractive distillation columns. The concentrated butylenes are then dehydrogenated in practically the same manner as butane and the resultant crude butadiene is passed through a series of fractionating and extractive distillation columns until the final product, butadiene, is a 98 per cent pure stream.

Copolymer plant.—On November 1, 1950, the company formally assumed operations of a Government-owned copolymer plant, adjacent to the Plains butadiene plant.

Butadiene produced at the Plains plant is piped to the copolymer plant (45,000 long tons per year design capacity) and mixed with styrene in an emulsion (soap solution) with other chemicals. The ingredients react to form a milky substance (latex). The reaction is chemically halted at a predetermined conversion level and the product is treated with an acid which coagulates the latex into sponge-like particles. The particles are agglomerated, separated from the soap solution, dried, and compressed into 100-lb. bales for shipment to tire and other rubber-goods manufacturers.

Furnace-black plants.—Phillips Chemical Co. operates the world's largest furnace-black plants (approximately 200,000,000 lb. per year capacity) at Borger. These plants produce two special-type blacks (HMF and HAF) used principally in the compounding of natural and synthetic rubber, with one of them (HAF) being particularly adapted to use in cold-rubber tires.

The present HAF facilities are being expanded to meet increasing demands. Hydrocarbon liquids are burned with a controlled amount of air and the resulting furnace black is precipitated from the effluent stream, pelleted, and packed in bags or shipped in bulk to domestic and foreign consumers.

Liquid Carbonic Corp.

Its many plants manufacture "dry ice" from oil; new Houston operation makes use of natural gas

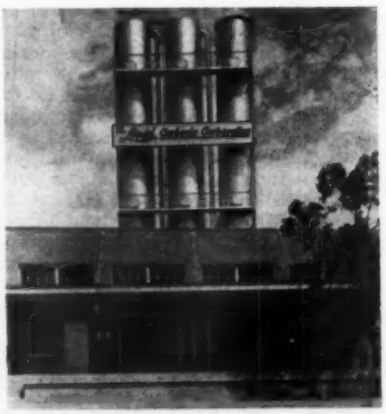
THE Houston plant of Liquid Carbonic Corp. is one of many such plants owned and operated by this company, and located throughout the United States, Canada, and South America. Last year the Houston plant was enlarged and at the same time machinery and equipment were added to make dry ice as well as liquid CO_2. The process used at Houston is very similar to that used in many Liquid Carbonic plants throughout this country. Fuel is burned in a furnace underneath a boiler. At Houston this is natural gas—at many other plants oil is used. The carbon in the fuel is burned to carbon dioxide which winds up as the final product.

Manufacture of CO_2

Details.—The flue gases taken from the boiler furnace are passed through water scrubbers where most of the impurities are scrubbed out. The gases then pass through an alkaline absorbing system counter-current to absorbing liquors. There are three 8-ft. diameter by 85-ft. high absorbing towers through which the gases are passed in series. The alkaline absorbing liquors pick up the carbon dioxide from the gases and the liquor is passed through heat exchangers and into plate tower and then to a reboiler. In the plate tower and reboiler the liquor is heated and gives up the CO_2 gas. The CO_2 gas is then 100 per cent strength and after cooling is sent to compression equipment.

The CO_2 gas is compressed in several stages by a steam-driven compressor. In one of the intermediate stages, the gas is further purified by passing it through special scrubbing equipment. After the gas has been compressed to 1,000-1,200 psi., it is liquefied and pumped into either 20 or 50-lb.-capacity cylinders. This liquid CO_2 is then sent out to the trade and is used for carbonation purposes, etc.

Dry ice.—If it is desirable to convert the liquid CO_2 into dry ice, this is done by several stages of evaporation, cooling a portion of the liquid CO_2 until it is solidified at atmospheric pressure. The CO_2 is solidified in very fine crystalline form and the crystals are mechanically pressed into a solid opaque block to a density of approximately 90 lb. per cubic foot. The gases evolved when the liquid CO_2 is expanded and evaporated are recompressed so that no product is lost in conversion from liquid CO_2 to dry ice.



HOUSTON, TEX.—New dry ice plant.

Commercial Solvents Corp.

Building new ammonia plant at Sterlington, La.

COMMERCIAL SOLVENTS CORP. is currently constructing a $1,000,000 addition to its Sterlington, La., ammonia plant. The addition will be placed in operation early next year for the production of nitrogen solutions.

The present Commercial Solvents plant at this location produces anhydrous ammonia from natural gas, chiefly for use as a soil enricher.

PITTSBURG, KANS.—Parent plant of Spencer Chemical Co. manufactures ammonia, ammonium nitrate, methanol, dry ice, and ammoniating solutions.

Spencer Chemical Co.

Plants in Kansas, Kentucky, and Illinois make products for agriculture and industry

NATURAL gas takes on a significant role at the huge, ultramodern petrochemical plant of Spencer Chemical Co. in southeastern Kansas. The role of natural gas is that of "starting ingredient" in manufacturing chemicals. As a result, in this plant natural gas is upgraded in large scale into commercial products for agricultural and industrial use.

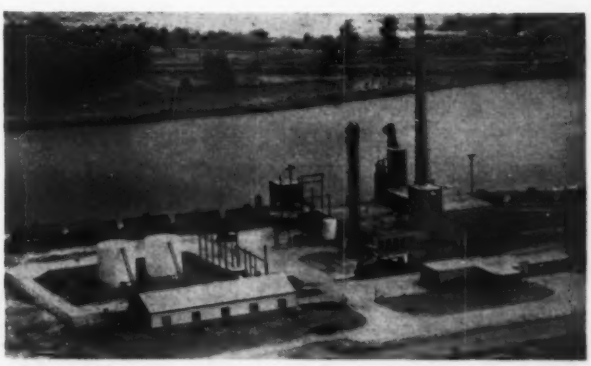
Spencer Chemical uses only three items for its raw material—natural gas, steam, and air. From these are made in large-tonnage quantities four valuable commercial materials—ammonia, ammonium nitrate, methyl alcohol, and dry ice—plus other products.

Location of Spencer Chemical Co.'s principal plant, its Jayhawk Works, is 22 miles south of Pittsburg, Kans., and the area used by the manufacturing and auxiliary building and equipment covers 168 acres. Natural gas for this petrochemical manufacture is purchased from Cities Service's gas pipe lines, which originate in the gas fields of Texas, Oklahoma, and Kansas.

The processing steps that the company uses at Pittsburg in turning natural gas, air, and steam into commercial products, including NH_3, NH_4NO_3, CH_3OH, and solid CO_2, divide into six principal manufacturing plants: (1) gas reforming plant, (2) ammonia plant, (3) nitric acid plant, (4) ammonium nitrate plant, (5) graining plant (located at Parsons, Kans.), and (6) dry-ice plant. In the graining plant, the resultant high-nitrogen fertilizer is coated and parted with suitable anticaking conditioners, then automatically packed in moistureproof 100-lb. paper bags for shipment.

The Jayhawk Works was originally constructed for the War Department; begun in the fall of 1941, it was completed months ahead of schedule and at a considerable saving over the estimated cost. Before V-J Day in 1945, a comprehensive plan was formulated for postwar use, to produce chemicals for industry and agriculture. Spencer continued to operate

HENDERSON, KY.—Second large ammonia plant of Spencer Chemical.



CALUMET CITY, ILL.—New Spencer Chemical formaldehyde plant.

XUM

Jayhawk under government supervision until June 1, 1946, when it was purchased by Spencer.

Spencer's Henderson and Charlestown Works

Spencer Chemical Co.'s new Henderson Works was formerly Ohio River Ordnance Works, built by the Government during World War II. Spencer Chemical purchased the plant in May of this year. At the same time Spencer obtained a lease on nitric acid and ammonium nitrate manufacturing facilities located within the Indiana Arsenal at Charlestown, Ind. Necessary equipment for the production of Spencer's ammoniating solutions (Spensol) is now being constructed at the Charlestown Works and, upon its completion, ammonia from the Henderson Works will be used as the basic raw material for the manufacture of nitric acid, ammonium nitrate, and Spensol solution.

The process presently in use at the Henderson Works utilizes coke-produced water gas as the basic source of hydrogen. Spencer is now constructing gas reforming facilities for utilization of natural gas rather than coke and, when this modification is completed, the Henderson Works will be the only ammonia plant in the country capable of operating on either coke or natural gas. Natural gas at this location will be supplied by Texas Gas Transmission Corp.

Chicago Works of Spencer Chemical

Spencer's Chicago Works, located at Calumet City, Ill., produces approximately 50 tons of formaldehyde a day using methanol, shipped by tank car from the Jayhawk Works, as a basic material. The methanol vapor is mixed with scrubbed air and directed to a burner room where at high temperatures (500° C.) over a metallic catalyst, formaldehyde gas is produced. This converted gas is then absorbed in condensate within three stainless-steel towers (33 ft. high) producing crude formaldehyde. The crude product is distilled in a 96-ft. stainless-steel column.

The resulting 37 per cent formaldehyde solution is distributed to consumers by specially constructed tank trucks, tank cars, barrels, and direct pipe line. The utilities plant at the Chicago Works has two boilers; the steam generated powers the air blowers and provides heat for distillation of the crude formaldehyde.

Mathieson Hydrocarbon Chemical

New Kentucky plant will manufacture products ranging from antifreeze to ingredients for cellophane

PRODUCTS to be manufactured at Mathieson Chemical Corp.'s new plant at Doe Run near Brandenburg, Ky., will be used by other chemical companies and manufacturers to make everything from antifreeze to cellophane. Mathieson Hydrocarbon Chemical is a new company recently organized by Mathieson Chemical Corp. and the stockholders of Tennessee Gas Transmission Co.

In commenting on the new company. Thomas S. Nichols, president of Mathieson Chemical Corp., states:

"This development means the entry of Mathieson into the important and growing field of petrochemicals. Already an important factor in the alkali, chlorine, nitrogen, and fertilizer industries, Mathieson will now further diversify its products and markets."

Will Be $27,000,000 Organization

The $27,000,000 company will produce chemicals from hydrocarbons contained in the natural-gas stream transported by Tennessee over its pipe-line network which runs from Texas and Louisiana fields to the northern and eastern markets.

To tap this natural-gas stream and transport the mixed hydrocarbons, a 60-mile pipe line will be constructed from an extraction and recovery plant (stripping plant) to the new corporation's site at Doe Run, 35 miles southwest of Louisville. The stripping plant will be built by Tennessee Gas at Gabe near Greensburg, Ky., adjacent to its natural-gas pipe line. The construction of all three units is expected to be completed by early fall of 1951.

The Mathieson plant will include a fractionation and cracking unit and a chemical plant. There will also be a power plant for supplying steam to the production units, waste-disposal facilities, a laboratory, an office building, maintenance shops, warehouses, and transportation facilities.

The new corporation's proposed products fall into two general classes: (1) organic chemical products, including ethylene glycol, ethylene oxide, polyglycols, and ethylene dichloride, and (2) petroleum products, including commercial propane, commercial butane, and natural gasoline.

Ethylene glycol, which is expected to be Mathieson Hydrocarbon's principal product, is used mainly as a permanent-type antifreeze, as an additive in the production of cellophane, as a raw material in the production of Glyoxal for shrinkproofing rayon, as an ingredient of hydraulic fluid, and in making dynamite.

The new plant's production of ethylene glycol will be equivalent to about 10 to 15 per cent of present United States production.

Ethylene oxide is used mostly as an intermediate in the production of ethylene glycol. Approximately 70 per cent of the ethylene oxide produced in the United States during 1949 was converted into ethylene glycol. Ethylene oxide is also used in the manufacture of nonionic detergents and acrylonitrile.

Nonionic detergents are used in laundering, emulsification, and other commercial uses where foaming or suds is not necessary or desirable. Acrylonitrile is used in the production of various nitrile-type synthetic rubbers and in the production of synthetic fibers such as Orlon.

The chemical plant will also produce as byproducts polyglycols (diethylene glycol and triethylene glycol) which are used in hydraulic fluids, as plasticizers for zein resins, and in air sterilization. Another product will be ethylene dichloride which is used in the manufacture of tetraethyl lead fluid and vinylchloride. Other byproducts are chloroethers which are used in making solvents, local anaesthetics, and ethyl cellulose.

The fractionation unit of the plant will turn out petroleum products such as liquefied petroleum gas, natural gasoline.

Mathieson Hydrocarbon, in addition to the Kentucky plant, also has under construction a $6,000,000 chlorine plant at Saltville, Va.

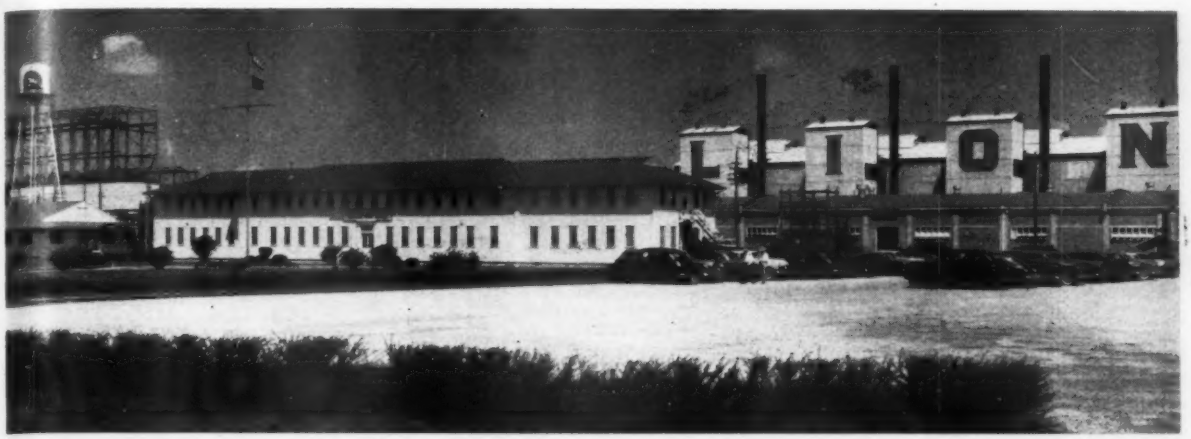
Mathieson Chemical Corp.

Takes hydrazine from laboratory to industry

LOOMING large on the horizon of chemical progress is hydrazine (N_2H_4), which first reached prominence as a superfuel for the stratospheric rockets under development by the Armed Forces.

Hydrazine was once just an expensive laboratory curiosity. But since Mathieson research and engineering solved the problems of synthesis and production, not only is there assured an ample supply of hydrazine for fuel, but also for its application in many other fields.

For instance, hydrazine is the basis for many new, ultraefficient insecticides and herbicides. One hydrazine compound promises to reduce the familiar drudgery of lawn mowing through slowing the growth of grass. Another is used to prepare a new antitubercular drug. Still others are used to silver mirrors, blow foam



EL DORADO, ARK.—Entrance view of Lion's chemical plant: at right are gas reforming units; center is administration building; left is gas synthesis units.

rubber, make new plastics and disinfectants, to creaseproof textiles, and stabilize fats.

Mathieson chemical plants are summarized in the following paragraphs:

Houston.—This is a sulfur-processing plant which manufactures grinding sulfur, some of which is sold as ground sulfur; others are conditioned to grades of free-flowing sulfur.

Pasadena.—Plant manufactures sulfuric acid, ammonium sulfate, ammonium phosphate, superphosphates, and high-analysis pelletized fertilizer.

Port Arthur.—There are two sulfuric acid units located here on land leased from The Texas Co. The plant also processes recovered acid from The Texas Co.

Beaumont.—Mathieson has two contact sulfuric acid units.

Mathieson also has plants in:

Saltville, Va., the location of Mathieson's original plant, manufactures caustic soda, soda ash, bicarbonate of soda, dry ice, carbonic gas, and fused alkali products.

Niagara Falls, N. Y., plant manufactures caustic soda, chlorine, ammonia, hypochlorite products, sodium chlorite products, and sodium methylate.

Lake Charles, La., plant manufactures sulfuric acid, ammonium sulfate, superphosphate, and mixed fertilizers.

Baltimore, plant manufactures sulfuric acid, ammonium sulfate, superphosphate, and mixed fertilizers.

North Little Rock, Ark., plant manufactures sulfuric acid, ammonium sulfate, superphosphates, and mixed fertilizers.

Bossier City, (Shreveport), La., is site of another sulfuric acid plant.

At Macedonia and McKamie, Ark., Mathieson sulfuric acid plants use a Mathieson-developed process utilizing acid sludge, remaining from the treatment of petroleum with sulfuric acid, to produce coke and sulfur. In another recovery process, sulfur of an extremely high quality is produced by passing the gas mixture obtained from the purification of refinery gas or of natural gas through a combustion furnace. The hydrogen sulfide is thus converted to hydrogen and water.

At Williamston, N. C., and Lebanon, Pa., are fertilizer-mixing plants. The company also manufactures agricultural insecticides and fungicides at the Little Rock, Williamston, and Houston plants.

Lion Oil Co.

Petrochemical operations rank among the largest of any of the oil companies

LION OIL CO. is incorporated in Delaware but has its main offices in El Dorado, Ark. Lion employs more than 2,300 people and engages in every phase of the oil business. In addition, its activities in the petrochemical field rank among the largest of any oil company regardless of size.

Originally known as Ozark Ordnance Works, Lion's chemical plant was constructed by the U. S. Government at a cost of approximately $28,000,000 to produce anhydrous ammonia for wartime uses. Lion, through a wholly owned subsidiary, operated the installation for the Army Ordnance Department. In May 1946, Lion took over the plant for private operation on a leased basis and on March 2, 1948, purchased it outright. The company has, at a total cost of more than $10,000,000, made improvements and additions which have increased capacities and diversified output. Principal purpose of the plant is to produce synthetic nitrogen.

Basic product of the Lion plant is anhydrous ammonia which is made from gas, air, and water. Production capacity is 570 tons of ammonia per day, approximately one-fourth of which is sold as such. The remainder is used in the manufacture of other materials. There are three principal steps in the ammonia manufacturing process used at Lion's chemical plant—gas reforming, purification, and synthesis.

A portion of the ammonia product goes to the nitric acid plants for manufacture into nitric acid (HNO_3). There are two of these plants, of slightly different design, size, and operating conditions.

The nitric acid is an intermediate product (seldom sold as such by Lion) used in the manufacture of other materials at two other installations. At both the acid is neutralized with ammonia to form ammonium nitrate solution (NH_4NO_3) of approximately 83 per cent strength.

At one point this solution is fortified with additional quantities of ammonia to make Lion nitrogen solutions. Nitrogen solutions are used by fertilizer manufacturers as a nitrogen source in the making of mixed fertilizers. At the other plant the 83 per cent ammonium nitrate solution is concentrated under vacuum to approximately 96 per cent solution. This material is sprayed through especially designed nozzles at the top of a "shot tower" to fall approximately 100 ft. against an updraft of conditioned air. As it falls, the ammonium nitrate is solidified in the form of spherical pellets which are finally coated with a light layer of storage conditioning clay. The material is bagged in 100-lb. packages for shipment as finished ammonium nitrate fertilizer, having minimum nitrogen content of 33.5 per cent.

New Sulfuric Acid Plant

One of the newest installations at the chemical plant is the plant for making sulfuric acid. For this operation an additional raw material, sulfur, is brought in. Texas bright sulfur is burned in the presence of dried air. The sulfur dioxide (SO_2) thus formed is oxidized in the presence of a catalyst to sulfur trioxide (SO_3)

XUM

TEXAS CITY, TEX.—A multimillion-dollar expansion program is scheduled for this Monsanto plant. Acrylonitrile, plastics, and synthetic rubber will be among the new products.

which is absorbed in water to produce sulfuric acid (H_2SO_4). This plant utilizes (at capacity) 100 tons of sulfur per day to make 300 tons of 98 per cent sulfuric acid.

At another plant the sulfuric acid is neutralized with ammonia to produce sulfate of ammonia—$(NH_4)_2SO_4$. This material is dried and transferred by conveyor to the bulk storage silo or to the bagging room. Shipment is made both in bulk (in railway box cars) and in 100-lb. bags. Capacity of Lion's plant is 380 tons daily of crystalline product.

San Jacinto Carbon Corp.

New company takes over Houston ammonia plant

SAN JACINTO CHEMICAL CORP. has recently taken over the operation of San Jacinto Ammonia Works located at San Jacinto Ordnance Depot. The plant was moved to its present location from Louisiana, Mo., where it was operated during World War II as Missouri Ordnance Works.

R. F. Hopkins is vice president in charge of operations for the new company, which is a subsidiary of R. F. Mueller Co., Baltimore.

The plant has a production capacity for anhydrous ammonia of 70 tons per day. The primary raw material for the manufacture of this chemical is natural gas.

Monsanto Chemical Co.

Company has announced a $30,000,000 program of expansion over the next few years

A $30,000,000 expansion program over the next few years for Monsanto Chemical Co., a major portion to be at Texas City, Tex., has been announced by William M. Rand, company president.

The new program includes the production of acrylonitrile and related chemicals by a process direct from acetylene. Acrylonitrile is an important ingredient in synthetic fibers, plastics, and synthetic rubber, all of which are closely related to war production.

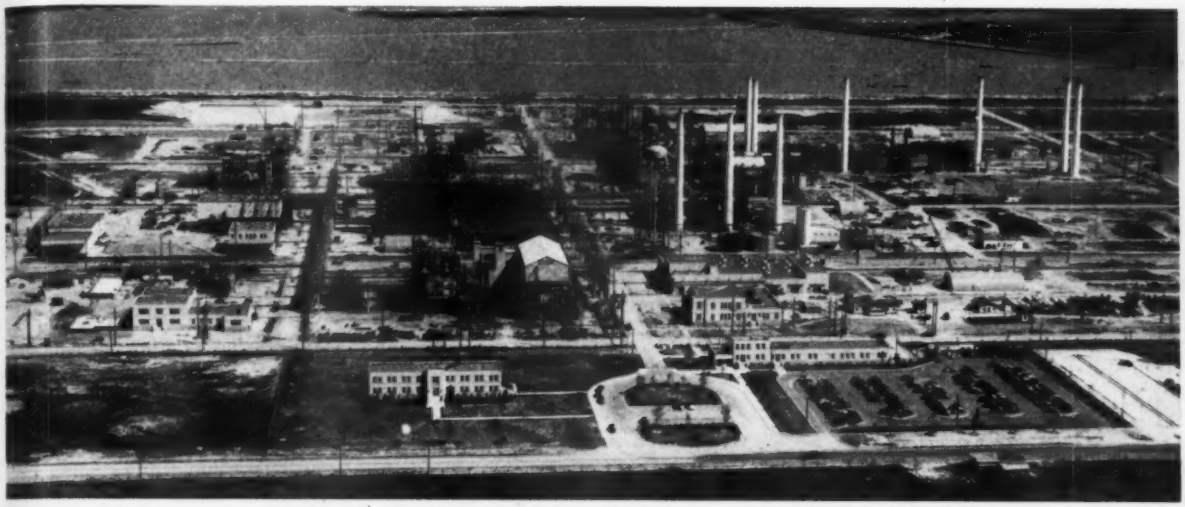
Power and other utility extensions are contemplated for the increased need of the manufacturing units. It is expected that the major part of the work will be completed in 1952. Several contractors will be involved in handling the different phases of the work.

The new facilities will be located immediately adjacent to the present styrene plant site and will add approximately 50 per cent to its present payroll.

Monsanto's styrene monomer plant at Texas City was originally constructed in 1943 as a part of the Government's synthetic-rubber program and was operated for Rubber Reserve Corp. until October 1946 when it was purchased by Monsanto from the Government. Destroyed on April 16, 1947, by the disastrous explosion of 2,300 tons of ammonium nitrate aboard the French freighter Grande Camp loading in the adjacent Texas City harbor area, the plant was rebuilt and put into operation in August 1948. Approximately 40 per cent of all styrene monomer produced enters the Government's synthetic-rubber program, with the major part of the remainder being sold as polystyrene under Monsanto's trade name Lustrex.

Basic raw materials for the production of styrene monomer are propane from the petroleum industry and benzene, a byproduct of coke ovens. These raw materials are combined in a series of chemical reactions to produce vinyl benzene, the chemical name for styrene monomer.

The expanded facilities will operate under the present plant management headed by Joseph R. Mares, Monsanto vice president and general manager of the company's Texas division. The construction is in line with the company's previously an-



ORANGE, TEX.—Here du Pont manufactures chemical intermediates for nylon; two other new units will produce methanol and polythene.

nounced intention of expanding its Texas operations.

The new facilities follow a long engineering and research study. They will embody new chemical processes in the production of acrylonitrile and other basic chemicals which company engineers and research scientists have worked out and tested in pilot-plant operation. Acrylonitrile has become increasingly important in Montanto's expanding operations and while it has not heretofore been produced by the company it has long been under study.

J. M. Huber Corp.

Building carbon-black plant at Baytown, Tex.

CONSTRUCTION is under way on a new $1,500,000 carbon-black manufacturing plant 8 miles north of Baytown, Tex. J. M. Huber Corp. is building the plant.

The plant will have a capacity of 30 million pounds of HAF type carbon black and is scheduled for completion by March 1, 1951. The 300-acre site for the new plant is on the flank of Barber's Hill oil field in Chambers County and a few miles from Esperson Dome field of Harris and Liberty counties. Oil from nearby refineries will be used as a raw material for the operation.

The Huber corporation operates the largest channel-black plant in the world at Borger, Tex. It also owns over 400 producing wells in Texas and three western states. Its operations also include kaolin clay mines in Georgia and South Carolina, products used in rubber and paper industries, and production of other rubber chemicals.

E. I. du Pont de Nemours & Co.

Construction under way on third Texas plant; eastern plant to produce new super fiber

DU PONT has in the late stages of construction the first unit of a third Texas plant near Victoria. The company's two other Texas plants are the Sabine River Works near Orange and the Houston Works at La Porte.

Victoria plant.—Some time after the middle of 1951, du Pont expects to have in full production the first unit of its Victoria Works for manufacture of chemicals used in the production of nylon. Product will be shipped, for further processing, to the Sabine River Works before being sent to plants at Seaford, Del., Martinsville, Va., and Chattanooga, Tenn., for the manufacture of nylon yarn and staple, and to Parkersburg, W. Va., for the production of nylon plastic.

The Victoria Works is located on a 1,700-acre site on the Guadalupe River 10 miles south of Victoria. Most of the manufacturing units will be in open buildings typical of modern chemical plants, particularly in this part of the country.

Sanitary wastes will be treated in an approved plant which provides for complete treatment of the sewage. An incinerator, evaporation basins, and mile-deep well will carry off byproduct wastes. The well is constructed in such a way that industrial wastes can be injected into a salt-water stratum in much the same way that oil-field operators return brine pumped out with petroleum to subsurface formations.

Sabine River Works.—This plant is located on a 1,000-acre tract on the Sabine River about 3 miles north of Orange, Tex., and employs 1,700 men and women in the manufacture of methanol; polythene, a plastic sold to other manufacturers who make it into such things as electrical insulation, cosmetic bottles, chemical containers, and film for packaging; and chemicals which other du Pont plants process into nylon yarn and plastics.

Principal raw materials used by Sabine are natural gas, benzene, petroleum cyclohexane, and propane. All but benzene are produced by the petroleum industry.

The plant converts natural gas into carbon monoxide and hydrogen by reacting the gas with steam over a catalyst. By a process of high-pressure synthesis, carbon monoxide and hydrogen are made into methanol. Some of the carbon monoxide and hydrogen, by another reaction, is converted into gases used in making a chemical employed in the manufacture of chemicals used in the production of nylon.

Petroleum cyclohexane also is used in the manufacture of these chemicals, and propane is a starting material in the production of ethylene gas which is polymerized by high-pressure synthesis into the plastic, polythene.

Houston Works.—Located at La Porte, this Texas plant employing 360 persons in the manufacture of agricultural chemicals important to ranchers and farmers. The principal products are phenothiazine, now widely used to control worms in sheep, goats, cattle, hogs, chickens

XUM

BATON ROUGE, LA.—This Ethyl Corp. plant has been continuously expanded, is now the largest chemical plant of its kind in the world.

and other animals and fowl; "Fermate" and "Zerlate" fungicides, and an insecticide called benzene hexachloride.

Relation of du Pont to Petroleum

As a measure of the magnitude of the mutual stake du Pont and the petroleum industry have in their futures, this company last year made between 5 and 6 per cent of its total sales and purchases in this industry. With 42 companies in the industry, it did a total business of more than 80 million dollars.

Du Pont's ties with the petroleum industry antedate its building of plants in Texas. For years, its research laboratories were at work developing the specialized materials and equipment required by the industry for effective exploration and production. To meet, for instance, exploring crews' need for a blasting agent that would withstand rough handling, company scientists several years ago came up with one that not even a high-caliber bullet would explode. They also developed a new electric blasting cap that simplified seismological explorations.

While du Pont makes special corrosion and weather-resistant paints and finishes and a long line of chemicals for the oil companies, its closest association with the industry is through its Petroleum Chemical Division, which manufactures and distributes tetraethyl lead antiknock compounds for gasoline, and other petroleum additives.

New Orlon Plant

A new $20,000,000 plant, located 3 miles south of Camden, S. C., for the production of du Pont's new synthetic textile fiber Orlon, was recently opened with appropriate ceremonies, Crawford H. Greenewalt, du Pont president, presiding. The du Pont research for a super textile, Greenewalt stated, began about 10 years ago. Du Pont chemists in the research work made textile fibers from several thousand different bases or polymers, studying their properties and examining their usefulness. Properties of the new Orlon fiber include durability; resistance to soot, sunlight, and other factors which tend to shorten fiber life, and particularly good laundering properties.

Produced from Ethylene

Orlon is the newest fiber synthesized by du Pont. This fiber is a high-strength yarn manufactured from polyacrylonitrile.

Orlon is produced by polymerizing acrylonitrile, which is one of the constituents of the oil-resistant rubber buna-N and the fiber Vinyon N. Acrylonitrile is produced principally from ethylene via oxidation to ethylene oxide and the subsequent addition of hydrogen cyanide.

Properties of Orlon suggest its use in acid-resistant clothing, automobile tops, outdoor furniture, window curtains, sails, rainwear, and many articles of wearing apparel.

Ethyl Corp.

Plant now under construction at Houston; has large operations centered at Baton Rouge

HOUSTON has been selected by Ethyl Corp. as the site for new manufacturing plants to produce over a hundred million pounds of chemicals annually. The new plants will be integrated to manufacture tetraethyl lead, ethyl chloride, sodium, and chlorine used in the processes for producing Ethyl antiknock compounds. Work on the project has begun and will be completed by the end of 1951.

Principal raw materials are metallic lead, common salt, and petroleum gases. Principal manufacturing units will include buildings for the manufacture of tetraethyl lead, sodium-lead alloy, sodium and chlorine, and ethyl chloride.

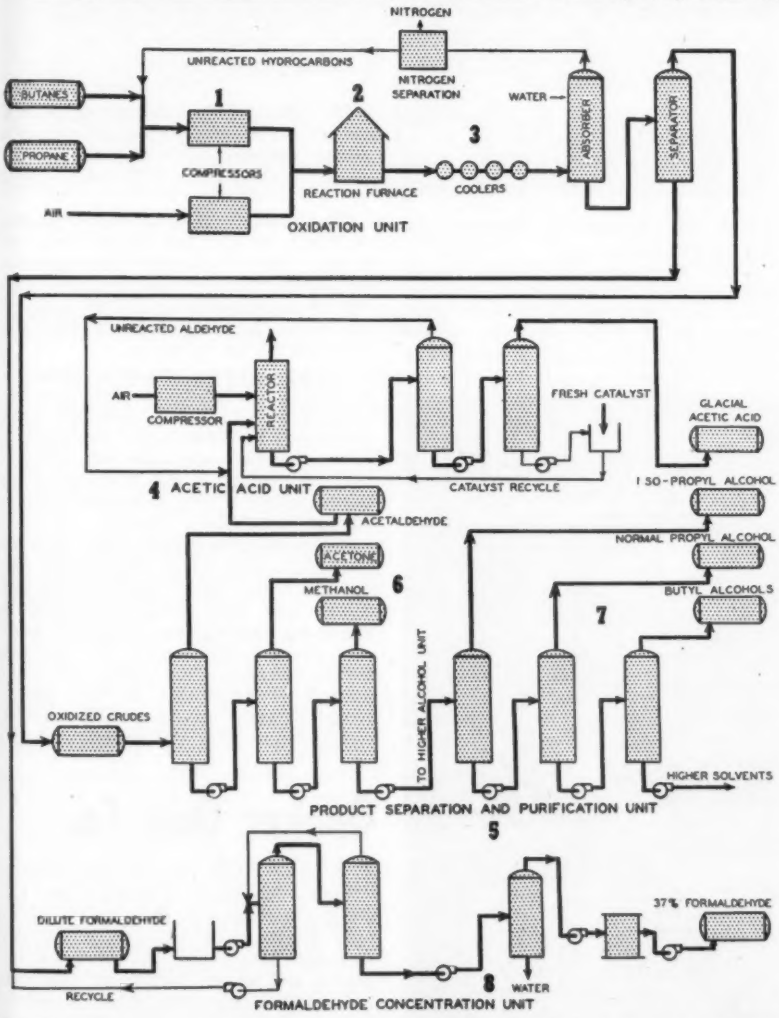
Huge Baton Rouge Plant

Manufacturing facilities of Ethyl until this time have been centered in Baton Rouge. The plant there has been continuously increased in capacity until it is now the largest chemical plant of its kind in the world. In addition to Ethyl antiknock compounds, the Baton Rouge plant is also the nation's largest producer of metallic sodium and ethyl chloride. Other products manufactured at the Baton Rouge plant include benzene hexachloride, which is a base for insecticides, and sodium sulfate, which is sold to the kraft-paper industry. The Baton Rouge plant employs 3,800 people.

Merichem Co.

MERICHEM CO. has recently added a new product—petrolatum—to those manufactured at its Houston plant. In addition to petrolatum, Merichem produces cresylic acid, petroleum waxes, and sodium sulfide from refinery byproducts.

BISHOP, TEX.—This huge Celanese Corp. plant converts natural gas, by direct oxidation, into a series of organic chemicals.



Starting with propane and butanes as raw materials, this flow chart shows step by step progress in manufacture of Celanese's products.

Celanese Corp. Of America

Has $30,000,000 plant at Bishop

THE Celanese Corp. of America Chemcel plant, constructed during the war years to supply critical materials, was completed in 1945. The site consists of about 1,000 acres located at Bishop, Tex., near Corpus Christi. Original construction cost was between $20-$25,000,000; present value exceeds $30,000,000.

There is a 50-acre development and research center at Clarkwood which investigate new chemicals derived from petroleum gases. The plant employs about 600 and the laboratories approximately 100.

The process employed at Bishop is the conversion of natural gas by direct oxidation into a series of organic chemicals. The accompanying diagram details the various units within the operation.

The gases are compressed by gas-engine-driven compressors. Either propane or butane, or mixtures may be processed independently. The oxidized gases are cooled and the chemicals removed by scrubbing with water. Unreacted hydrocarbons are recycled. A formaldehyde solution is concentrated to 37 per cent.

The remaining chemicals are processed through two purification units and the components are separated and purified. A separate unit produces glacial acetic acid by oxidation of acetaldehyde. Recent additions have been a propylene glycol processing plant and a paraformaldehyde unit.

The Chemcel plant draws its sup-

plies of butane and propane in direct pipe lines from recycling plants in the area. Several hundred thousand gallons per day are used. Natural gas is used to operate the gas engines, as boiler fuel, and as source of hydrogen.

Principal products produced at Chemcel are acetone, glacial acetic acid, acetaldehyde, methanol, and formaldehyde. The various forms of formaldehyde include a 37 per cent formaldehyde solution both in the inhibited and uninhibited form, a 44 per cent solution of uninhibited formalin, and a 25 per cent form of crude-gas liquid for oil-well application. More recently, paraformaldehyde, a dry flake form of formaldehyde, has been added, along with formcels, a series of alcohol solutions containing formaldehyde. These comprise the present formaldehyde products.

In addition to these, other chemicals produced at Chemcel are normal propyl alcohol, isobutanol, Celanese Solvent 203 (primary butyl alcohols), Solvent 601, methylal, propylene glycol, propylene oxide, and dipropylene glycol.

Diamond Alkali Co.

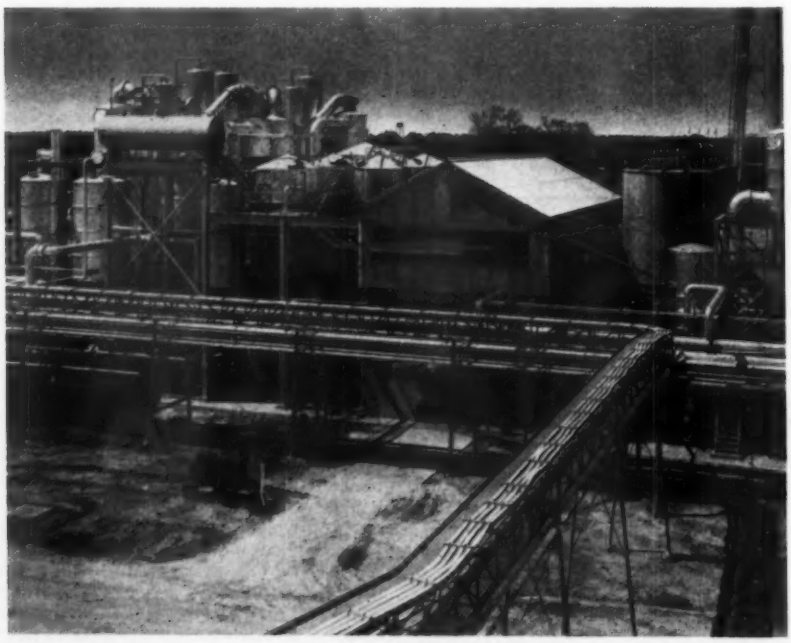
Plant on Houston Ship Channel one of the major postwar installations built in Gulf Coast area

THE nature and scope of Diamond Alkali Co.'s production operations for its Houston plant are highlighted by the following facts and figures. Located on the Houston Ship Channel, this is one of the major postwar installations built in the Gulf Coast area.

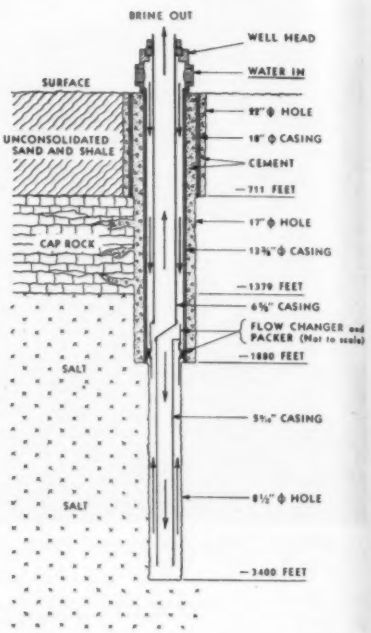
Costing $14,500,000, the Houston Works has a production capacity of 220 tons of liquid chlorine and 240 tons of caustic soda daily. Liquid chlorine is shipped in 30 and 55-ton tank cars, in 150-lb. cylinders, and in multiple-unit cars of 15 individual ton containers. Liquid caustic is shipped by tank car, while flake and solid caustic is packed in steel drums of 100, 400, and 700-lb. capacity for shipment via rail or truck. (Incidentally, one customer receives Diamond products by pipe lines which are the longest in the world for this purpose.)

The plant occupies a 325-acre site. The property faces 2,000 ft. on Houston Ship Channel. The plant uses 60,000,000 gal. of water a day—more than is used domestically in all of Harris County, which includes the city of Houston.

Large reserves of low-cost natural-gas fuel and underground salt domes were very important factors in locating this plant. Approximately 14,000,000 cu. ft. of natural gas is used daily.



HOUSTON, TEX.—Portion of Diamond Alkali's chlorine-caustic soda plant; caustic evaporation area is in left background.



VICE VERSA.—Oil producers drill wells to get oil, but Diamond Alkali digs them to produce salt water (for Na and Cl).

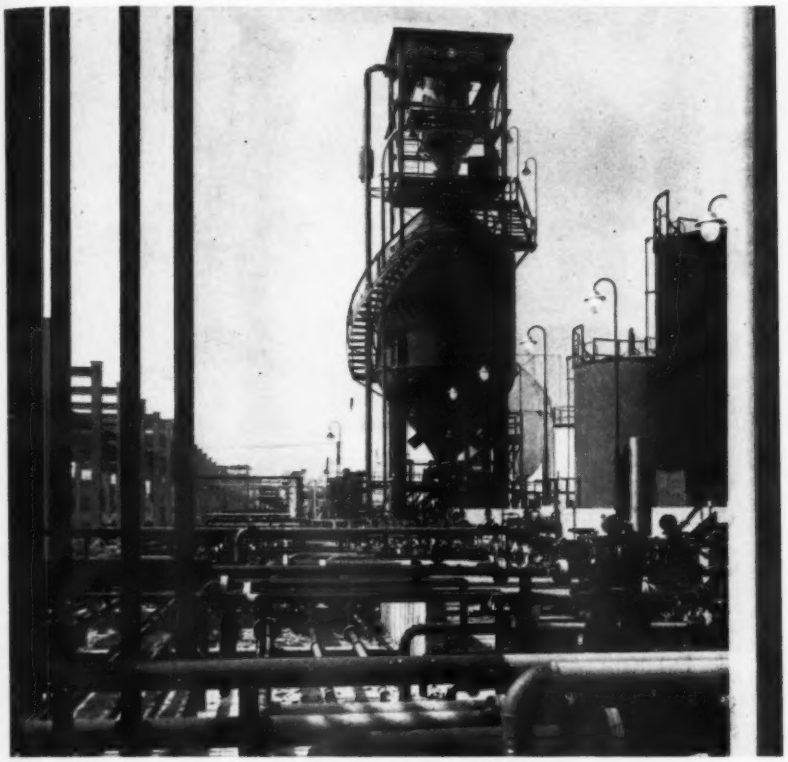
The plant is adjacent to the plants of Shell Oil Co. and Shell Chemical Corp., who by contract arrangement are large users of the chlorine and caustic soda produced. This location has made possible delivery of these products by pipe line.

Chlorine and caustic soda manufactured in this Diamond plant are derived from salt by a method most commonly referred to as "the electrolytic process"—passage of electric current through a salt brine solution, decomposing it into gaseous chlorine, caustic soda, and hydrogen.

At Barbers' Hill salt dome (and oil field), 17 miles away, 400,000 gal. per day of fresh well water is pumped down into the dome. The salt is dissolved, and the brine (25 per cent salt, 75 per cent water) is returned to the surface. This brine is transported by pipe line to the plant, ready to start on its transformation to liquid chlorine and caustic soda.

Quaker Oats Co.

EXCAVATION for the new Omaha chemical plant of Quaker Oats Co. started last month. Bids on the general construction of the plant are now in. The plant should be completed and in production of furfural, a versatile chemical used in petroleum refining, in making nylon and many other products, by the end of 1951.



HOUSTON, TEX.—Portion of processing equipment and piping at Shell's synthetic glycerin plant.

Shell Chemical Corp.

Firm has operations at Martinez, Pittsburg (Shell Point), Wilmington-Dominguez, Calif., and Houston

SHELL CHEMICAL CORP. has as its main function the manufacture and sale of chemicals derived from oil and natural gas. Since its incorporation in 1929, it has enjoyed a steady growth to a position of national prominence in its field.

First Plant at Pittsburg

Shell Chemical's first production venture was the manufacture of synthetic ammonia near Pittsburg, Calif., about 40 miles northeast of San Francisco, at Shell Point. This was the first ammonia plant in the United States to obtain its hydrogen by the decomposition of natural gas. The Shell Point plant also produces ammonium sulfate fertilizer, by means of a unique process in which spent sulfuric acid from oil refining operations is used instead of fresh acid, thereby establishing a second connection with petroleum.

Other Materials from Refineries

Simultaneously with its entry into the manufacture of synthetic ammonia from natural gas, Shell Chemical directed its attention towards utilization of raw materials available within Shell Oil's refineries, particularly byproduct gases from oil "cracking" operations which were at that time useful only as furnace fuel. These byproduct gases, unlike natural gas, contain reactive olefinic hydrocarbons. Research by Shell Development Co. opened several promising avenues of chemical synthesis based on ethylene, propylene, and the butylenes.

The first of these avenues was via catalytic hydration, leading to Shell Chemical's first class of primary organic chemicals, the alcohols, including principally ethyl, isopropyl, secondary butyl, and tertiary butyl alcohols. Plants for the manufacture of these important derivatives of refinery olefins have been built at Martinez, Calif. (near San Francisco); Dominguez, Calif. (near Los Angeles); and Houston. Each of these adjoins a Shell refinery and has played an important part in converting its byproduct gases, formerly considered as waste, into valuable chemical products.

At all three plants, the route beginning with hydration of the olefins is followed at least one step further, that is, to the corresponding ketones. Acetone, produced from isopropyl alcohol, and methyl ethyl ketone from secondary butyl alcohol, are among the company's most important products. Going still further, the list of acetone derivatives produced on a commercial scale increases almost daily and includes, among many other compounds, diacetone alcohol, mesityl oxide, methyl isobutyl ketone, methyl isobutyl carbinol, and hexylene glycol.

Shell Chemical's second important bridge from petroleum hydrocarbons to primary organic chemicals is chlorination. Allyl chloride, produced at Houston on a large scale by the direct substitutive chlorination of propylene, is of major interest as the starting material from which adjacent units manufacture allyl alcohol, diallyl phthalate, glyceryl epichlorohydrin and dichlorohydrin.

New Work at Big Houston Plant

Construction of a new plant for the manufacture of EPON resins is under way at the $54,000,000 Houston plant of Shell Chemical Corp.

EPON is the trademark used to designate a new series of synthetic resins. Various grades of EPON resins are used in surface coatings (paints, enamels, and varnishes), in adhesives (for bonding metal, wood, plastics, foam rubber, and a number of other materials to themselves and to each other), and in insulating compounds (as used on fine electrical wiring).

A new plant to denature ethyl alcohol is also being built for the Houston plant. The denaturing plant will supplement Shell Chemical's only existing denaturing plant, located at Sewaren, N. J., and will provide a more direct means of serving the regional market.

Shell's huge Houston chemical plant is located 20 miles outside of the city at Deer Park adjacent to Shell Oil Co.'s 115,000-bbl. refinery. Refinery products, which in the past have been considered waste but now have alternative valuable uses, are the basic ingredients of the score of major products produced.

Many of the products produced at the Shell plant are not made commercially from petroleum at any other plant in the world. These include: glycerin, acrolein, allyl chloride, epichlorohydrin, glycerol dichlorohydrin, 1, 2, 3 - trichloropropane, and "D-D" (trade mark registered), a soil fumigant.

The majority of the products produced by the plant are consumed as raw materials in associated chemical industries devoted to the manufacture of paints and lacquers, plastics,

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medicinals and pharmaceuticals, textiles, and explosives.

One of the most interesting of the several Shell Chemical plants is the operation at Houston for manufacuring glycerin.

Synthetic Glycerin Production

Utilizing petroleum as a raw material, Shell Chemical at Houston has the world's finest commercial synthetic-glycerin plant—a postwar development. The $8,000,000 plant is located on the Houston Ship Channel adjacent to the Shell Oil Co. Deer Park refinery. The glycerin plant is only part of the $54,000,000 chemical plant which has been built up since December 1940, when construction began on plants for producing isopropyl alcohol, acetone, and butadienne. By the end of 1948, 16 different units, producing 19 chemicals, were in operation.

A brief description of the synthetic glycerin process being used in the Shell plant is as follows: First, propylene is chlorinated at high temperatures to form allyl chloride. The allyl chloride is then reacted with caustic soda, chlorine, and water through a series of steps to form a dilute solution of glycerin. The crude glycerin is then concentrated, desalted, and purified.

Pontiac Ref.-Chicago Corp.

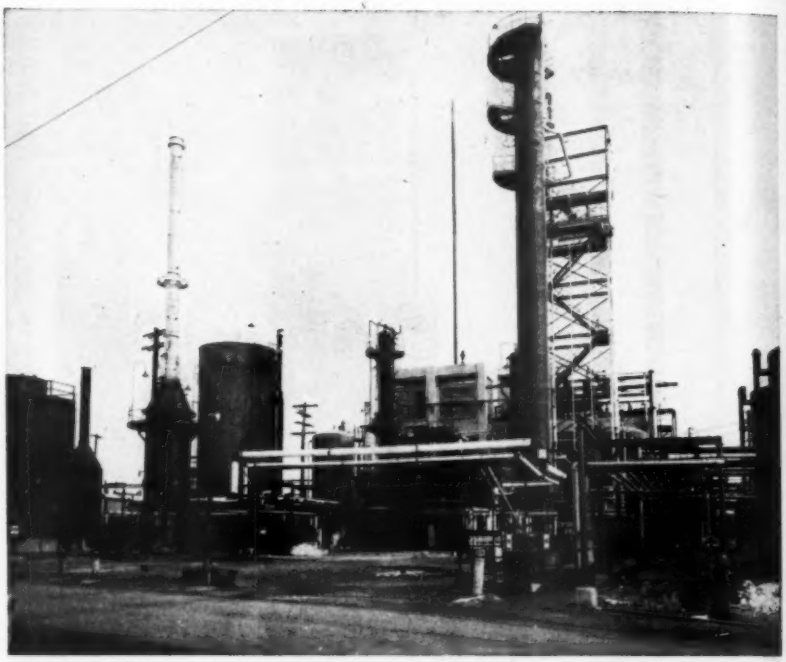
Joint operators reactivate wartime thermal cracker

PONTIAC REFINING CO. and The Chicago Corp., both of Corpus Christi, Tex., are reactivating the war-built Great Southern Corp. 4,000-bbl. thermal cracking plant. It is planned to produce butylene concentrate for the Office of Rubber Reserve, governmental agency in charge of rubber production. It is anticipated that operations will commence in January.

The two operators acquired the plant early this year as war surplus on a low bid of $756,000. The Great Southern plant produced butylene during World War II but was shut down for several years afterwards. It is expected that the butylene produced will be shipped to the Beaumont-Port Arthur area.

Continental Oil Black Co.

A $1,500,000 high-abrasive carbon-black plant is now under construction at Lake Charles, La., by the newly formed Continental Oil Black Co. The plant will obtain its raw materials directly from the Continental Oil Co. refinery, which is located on an adjacent site. Joint owners of the new company are Continental Oil Co. and Continental Carbon Co.



PHILADELPHIA.—At this plant, Chemical Products Section of Atlantic Refining Co. synthesizes its alkyl aryl sulfonate type synthetic detergent, which is marketed under trade name of Ultrawet.

Atlantic Refining Co.

Chemical-products section is one of nation's major synthetic-detergent producing operations

DETERGENTS represent one of the fastest-growing divisions of petrochemistry. A leader in this field is Atlantic Refining Co. (Chemical Products Section) which was the first petroleum company in this country to produce and market the alkyl aryl sulfonate type of synthetic detergents.

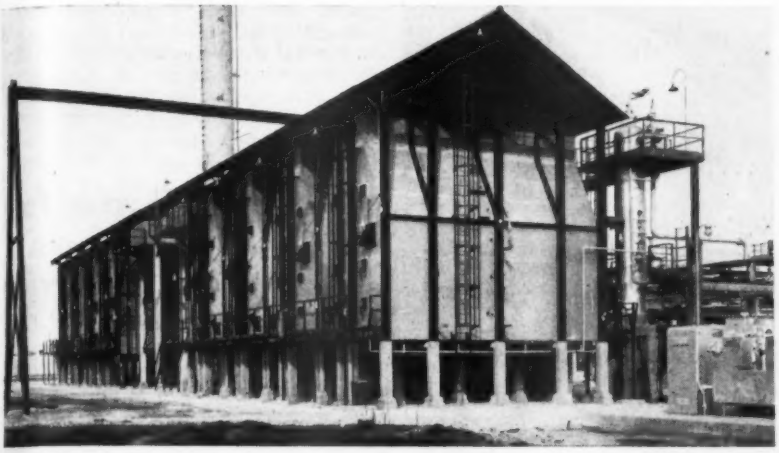
This type of petroleum sulfonate is now the leader among all synthetic detergents. The detergent industry has seen tremendous growth in the past few years, particularly in the field of household cleaning. In 1945 roughly 2 per cent of the total packaged household market, which is approximately 1,400,000 lb., was synthetic detergents. It is now estimated that 1950 will see from 40 to 45 per cent of this vast market made up of synthetic detergents. Further, the alkyl aryl sulfonates account for over 50 per cent of total synthetic detergents today.

Atlantic produces a variety of physical forms of these alkyl aryl sulfonates, as liquids, slurries, flakes, and beads. Petroleum-derived sulfonates are of different molecular weights and show corresponding variations in physical properties. A recently introduced alkyl aryl sulfonate was introduced which has shown tremendous promise in the textile and shampoo field, as well as for liquid household dishwashing products.

In addition to the synthetic detergents, Atlantic also is a prime producer of a number of olefins, the "building blocks" of the chemical industry. In addition to the more commonly produced propylenes, butylenes, and pentenes, the company produces diisobutylene, triisobutylene and nonenes, which find their way into a wide variety of end products such as plasticizers, rubber chemicals, lube-oil additives, surface-active agents, resins, and many other products.

Atlantic recently introduced Technical Eicosane, which is predominantly a C_{20} straight-chain paraffin. This material has shown unusual promise when chlorinated, since the chlorinated product has excellent stability and considerably lower viscosity than chlorinated waxes.

These petroleum chemicals are synthesized from refinery gases and streams at the company's chemical products section facilities located at the Point Breeze (Philadelphia) refinery.



PORT NECHES, TEX.—These two banks of cracking heaters are part of the ethylene unit of Jefferson Chemical Co.

Jefferson Chemical Co.

Jointly owned by The Texas Co. and American Cyanamid Co., has plant at Port Neches, Tex.

AN example of the dual interest of petroleum and chemical companies in the field of petrochemistry is Jefferson Chemical Co., founded in 1944 by The Texas Co. and American Cyanamid Co. The plant at Port Neches, Tex., was first placed on stream in 1947 and basic operations were substantially expanded earlier this year.

Feed stock for the chemical plant comprises refinery tail gases from the nearby 190,000-bbl. per day refinery of The Texas Co. at Port Arthur.

The principal products are ethylene glycol, ethylene oxide, and ethylene dichloride. The raw-gas stream entering the plant is first purified by selective extraction of hydrogen sulfide and carbon dioxide in ethanolamine. Cracking and low-temperature fractionation produces three main streams; ethylene, a distillate high in aromatic content, and a polymer stream.

In synthesizing the three principal original products, quantities of polyethylene glycol and higher chlorinated hydrocarbons are produced. Diethylene glycol, comprising an important fraction of the polyethylene glycol stream, was added to the list of basic products last March.

Other Products Being Studied

At the present time, several additional products are under consideration. Alkyl phenol C_9 is now under pilot-plant development. This petrochemical finds application as a detergent intermediate, a plasticizer, and a stabilizer. The ethanolamines represent another class of products currently under active investigation for possible volume production in the future.

Pan American Chemicals Division

Company was first to produce synthetic benzene from petroleum on a commercial scale

THE most interesting petrochemical operation being conducted by the Pan American Chemicals division of Pan American Refining Corp. at its Texas City, Tex., plant is the production of synthetic benzene from petroleum. The operation was first conducted on a plant scale experimentally in the early spring of 1949, and resulted in commercial production of benzene on a regular basis beginning about December 1, 1949.

While byproduct benzene was previously produced on a small scale, the Pan American operation represents the first commercialization of synthetic benzene from petroleum and thus marks an important technological date.

The Texas City plant is producing 5,000,000 gal. per year of the synthetic benzene. Quality of the material is excellent and all production has averaged approximately 1° C. boiling range, a freezing point of 5.3° C., color of 30+ Saybolt, H_2S and SO_2 free, and thiophene sulfur of less than 300 p.p.m.

Also Produce Hydrocarbon Resins

In addition to the benzene operation, Pan American is producing and marketing a number of hydrocarbon resins (trade name Panarez), used in the preparation of paints and varnishes and other protective coatings, floor tile, rubber compounding, and the like. These resins vary in color from dark to light lemon and in softening point from 130°-220° F.

A number of aromatic solvents having boiling ranges of 200°-600° F. and aromatic concentrations of from 50-95 per cent are also being produced by the company. These solvents are used as paint, varnish, and enamel thinners, as degreasing solvents in the preparation of insecticides, and for other uses.

Esso Standard, Sinclair, Standard of Indiana, Sun, The Texas Co.

Engaged in petrochemicals in varying degrees

MANY of the major oil companies located in the East and Mid-East are engaged in the petrochemical business to varying degrees. Some manufacture lube-oil additives, high-octane components, solvents, and detergents which are in turn blended and compounded with their own products. In general, operations of this character are not publicized by the companies.

An example is Esso Standard Oil Co., whose wide range of petroleum chemicals includes such aromatics as naphthenic acid and the aliphatic compounds, ethylene, propylene, butadiene, butylene, isobutylenes, isoprene and diisobutylene. At the company's Bayway and Baton Rouge refineries, acetone, ethyl ether, chlorinated paraffins, isopropyl alcohol, isopropyl ether, and other miscellaneous acyclic compounds are synthesized and separated. The company operates one of the few oxonation plants in this country, producing isooctyl and other high-molecular-weight alcohols at Baton Rouge.

Antioxidants, Detergents, Toluene

Sinclair Refining Co. is engaged in manufacture of antioxidants, petroleum detergents, and other additives for its own consumption at the East

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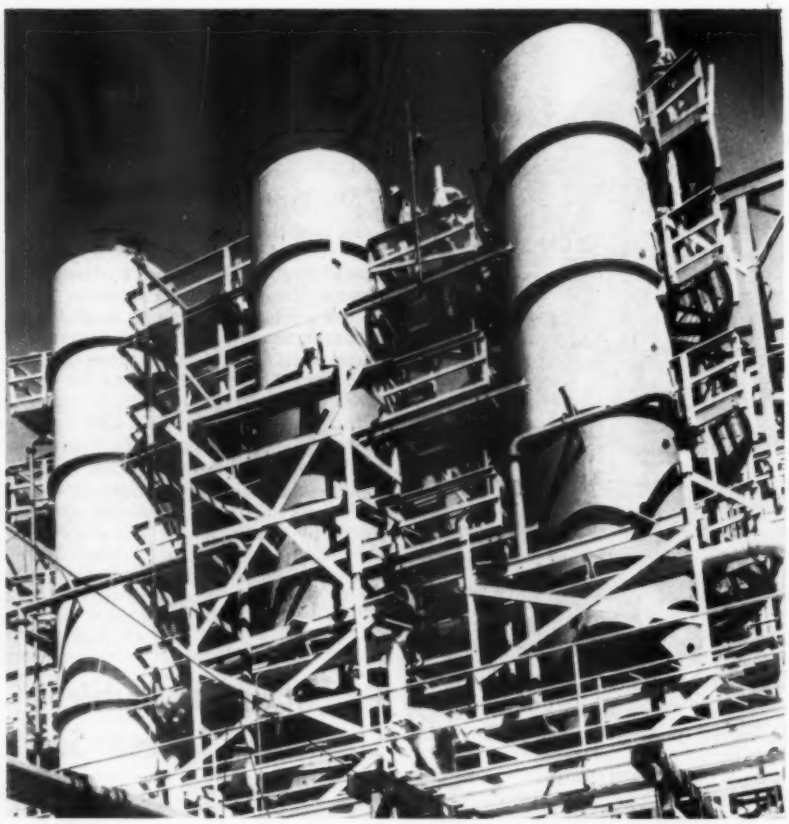

PORT NECHES, TEX.—These stripping columns for purification of synthetic rubber latex are receiving careful checking; Naugatuck Chemical Division of United States Rubber Co. is reactivating GR-S synthetic rubber plant for Office of Rubber Reserve.

Chicago refinery. Facilities for making nitration grade toluene are maintained at the plant, and the oil-layer-type petroleum sulfonates, better known as surface-active agents or detergents, include ammonium, barium, calcium, and sodium salts.

In addition to providing raw refinery gases to Union Carbide's major petrochemical plant at Whiting, Ind., Standard Oil Co. (Ind.) maintains its own chemical operations. Produced by that company are such aromatics as solvent-grade toluene, o-xylene and other xylenes, sodium carbolate, butylenes, and such surfactants as acid-layer-type petroleum sulfonates in aluminum and sodium salts.

Petroleum Sulfonates

Petroleum sulfonates, the olefinic "building blocks" and other aliphatic and aromatic hydrocarbons are produced at many other Eastern and Mid-Western refineries. Sun Oil Co. and The Texas Co. are also able to produce the oil-layer-type petroleum sulfonates in sodium salt form, as well as the conventional olefins. Sun in addition produces naphthenic acid.

United States Rubber Co.

Has 60,000-ton plant in Port Neches, Tex.

FIRST of the nation's all-purpose synthetic-rubber plants to be reactivated under the Government's expanded rubber program started production October 12. The plant, designed with production capacity of 60,000 long tons a year, has been thoroughly modernized by United States Rubber Co. engineers so that it will produce more than 72,000 long tons a year at peak load.

The rubber will be used to meet the nation's skyrocketing civilian and military demands for tires and other rubber products.

The plant represents a capital investment of more than $11,000,000. It was built in December 1943, and has been in standby since September 1947. During the war it reached a maximum production of 63,000 long tons annually.

United States Rubber Co. was one of the pioneers in synthetic rubber. During World War II it operated government-owned plants at Los Angeles, Naugatuck, Conn., and Institute, W. Va.

During the postwar period it has been operating plants at Naugatuck and Borger, Tex., while maintaining the Institute plant in standby condition.

B. F. Goodrich Chemical Co.

Port Neches plant makes "cold" and GR-S rubber

THE American rubber plant at Port Neches, Tex., is operated for the Government by B. F. Goodrich Chemical Co., a division of B. F. Goodrich Co.

This plant manufactures the new "cold rubber" as well as regular GRS. Both types of rubber are used for tire treads.

Production is made possible by a polymerization process under controlled temperatures, whereby butadiene and styrene are joined together to form American rubber latex. The latex is processed through a monomer-recovery system to remove unreacted monomers. It is then coagulated, dried, compressed into 75-lb. bales, and packaged.

In August 1949, one 30,000-ton unit was converted to the new cold rubber production. This necessitated the installation of refrigeration equipment, tanks, pumps, and piping.

The designed annual plant capacity for both types of rubber is 60,000 long tons.

SYNTHETIC RUBBER ARTICLE.—Complete roundup coverage of all current activity and list of plants, for synthetic rubber, appeared in the Journal issue of September 28, 1950, pages 56-57.

Jefferson Lake Sulphur Co.

Develops two new hydrocarbon processes

JEFFERSON LAKE SULPHUR CO. has developed a new process for the extraction of sulfur from sour gas, and also a method for the extraction of natural gasoline from gas and for the dehydration of gas.

The company has entered into agreements with Chemical Construction Co., a wholly owned subsidiary of American Cyanamid Co., in connection with the sulfur-extraction process. Engineers of the two companies are currently running pilot-plant tests and are preparing to make final tests at the Slaughter plant of Stanolind Oil & Gas Co.

Agreements in connection with the

method and equipment used for the gasoline extraction and gas dehydration unit have been made with Engineers & Fabricators, Inc., Houston. This company has built a unit and has run tests for a considerable period of time. It is believed that this equipment is nearing the point where it will be marketed.

Expansion Program Under Way

Jefferson Lake has a considerable expansion program under way for its sulfur-producing operations. The Long Point, Tex., plant is being expanded to provide greater water capacity which will result in increased production of approximately 250,000 tons a year. This plant receives its gas supply from the Pledger field through a Danciger Oil & Refining Co. pipe line.

A new sulfur plant is currently being constructed at Starks Dome, Calcasieu Parish, Louisiana. Completion date is set for approximately March 1, 1951. The company expects to produce in excess of 100,000 tons of sulfur annually from this plant.

Jefferson Lake has a third sulfur plant at Clemens Dome, Brazoria County, Texas.

Rohm & Haas Co.

First synthesis plant for hydrogen cyanide

THE Pasadena, Tex., plant of Rohm & Haas Co. manufactures hydrogen cyanide by direct synthesis, and acetone and ethylene cyandrin. The hydrogen cyanide is the basic raw material for the acetone and ethylene cyandrin, which are, in turn, intermediates for the manufacture of plastics.

The Pasadena plant is the first ever built for the large-scale production of hydrogen cyanide by direct synthesis. Raw materials include natural gas and ammonia. The intermediates for plastics are shipped by tank car and barge to sister plants by Rohm & Haas.

The company does not have any definite plans at present for any large construction project at the Pasadena plant. However, a new boiler and a small experimental project are now being erected.

The plant employs 136 persons.

Hancock Chemical Co.

Additional capacity is added to sulfur plant

SUBSTANTIAL additional capacity has been added this year to the sulfur-extraction plant operated by Hancock Chemical Co. (89 per cent of capital stock owned by Hancock Oil Co.).

This plant is recovering 70 tons of sulfur each day from waste refinery gases which heretofore have been discharged into the atmosphere.

A unique recovery arrangement is provided at the Hancock Chemical plant for desulfurization and sulfur recovery of waste refinery materials. The Hancock plant is a focal point for special pipe lines connected with the refineries of The Texas Co., Richfield Oil Co., Tide Water Associated Oil Co., and General Petroleum Corp.

The four neighboring refineries have their own installations for contacting sour gases with an aqueous solution of diethanol amine. The solutions are pumped to Hancock's plant. The stripped amine is then pumped back to the individual refineries. Hancock delivers the sulfur to Stauffer Chemical Co. in Los Angeles.

Dow Chemical Co.

Facilities at Freeport, Tex., will be enlarged by addition of $30,000,000 plant now starting

DOW CHEMICAL CO. is starting a $30,000,000 plant-addition program to its $100,000,000 existing facilities at Freeport, Tex.

Leland I. Doan, president, announced that substantial increases will be made in the production facilities of the power, ethylene, chlorine, styrene, glycol, vinyl chloride, and vinylidene chloride plants.

The vinyl chloride and vinylidene chloride plants manufacture the essential materials used in Dow's plastic which is sold under the trade name of Saran. Increased sales demand for plastics has made these increases in production necessary, company officials stated. Increased sales are also responsible for the expansion of the glycol and ethylene oxide facilities. The chlorine and ethylene plants provide the essential raw materials for the other plants.

Engineering and design work for the new units have been in progress, and the construction contracts awarded.

Dow has two plants—Plant A and Plant B—at its Freeport location. Construction on Plant A was begun in 1940 and first production began in early 1941. In July 1940 construction of the Ethyl-Dow Chemical Co. plant adjacent to Plant A was begun. This plant, owned jointly by Dow and Ethyl Corp., extracts bromine from sea water. Bromine is one of the essentials in the manufacture of ethyl fluid for high-test gasoline.

In early 1942 construction was begun on Plant B, then known as Dow Magnesium Corp., a plant owned by Defense Plant Corp. of the federal Government. This was a plant designed for the large-scale production of magnesium for use in the war effort. The first magnesium was produced in this plant on June 26, 1942.

After the war, excepting certain parts of this plant which were retained on a standby basis by the Government, Dow Chemical Co. bought it and the adjoining styrene plant. The styrene plant was built for the Government in 1943 as a part of its synthetic-rubber program.

In addition to magnesium, bromine, and styrene, the company produces chlorine and hydrogen. An ammonia plant is currently under construction. Raw materials used include natural gas, sea water, oyster shells, and common salt.

Long-Term Gas Reserves

Dow is now using a very substantial amount of gas and oil as a raw material in several of its processes. Brazos Oil & Gas Co., a wholly owned subsidiary company of Dow, was organized originally to insure its Texas division of ample long-range gas resources for both power and process use.

Products from Ethylene

Dow uses liquefied petroleum gases as cracking stock for the production of unsaturated compounds and for making chlorinated hydrocarbons. Dow's activities in this field may be divided into the following four sections:

1. **Ethylene.** — Ethylene is chlorinated to form ethylene dichloride. Vinyl chloride is derived from ethylene dichloride with hydrochloric acid as a byproduct. Byproduct hydrochloric acid is used by Dowell Incorporated for acidizing oil wells and to react with ethylene to make ethyl chloride.

Further chlorination of ethylene dichloride to trichlorethane also is accomplished, in order to make vinylidene chloride. The latter is a raw material in the manufacture of a member of Dow's plastic family, Saran.

Another product made from ethylene via chlorination is ethylene oxide. In this process ethylene is treated with chlorine and water to form chlorohydrin which is reacted with lime to form ethylene oxide. From ethylene oxide come the ethanolamines, ethylene glycol, and the glycol ethers which are used as solvents.

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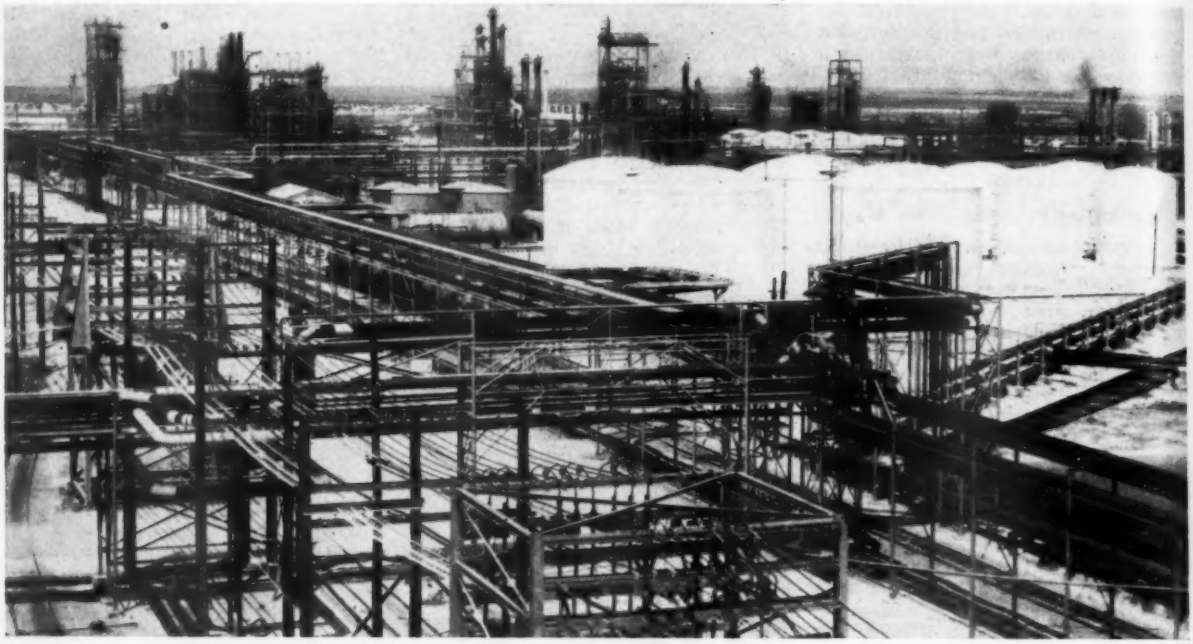

FREEPORT, TEX.—View of part of complex system of piping, process vessels, towers, and storage tanks comprising light hydrocarbon facilities at Plant "A" of Dow Chemical Co.

The second branch of the ethylene tree is that of ethylbenzene, formed by the reaction of ethylene with benzene. From ethylbenzene comes styrene, basis of Dow's chief plastic, Styron, a transparent molding plastic. Polystyrene latices are used in coating and paints, rubbers, and other polymers. Ion-exchange resins are also being made from styrene copolymers.

Third main ethylene derivative is diethylbenzene, whence comes ethyl vinylbenzene and divinylbenzene. The latter is also used in rubbers and polymers.

Ethylene is also brominated to form ethylene dibromide, ingredient in antiknock gasoline, solvent, and fumigant.

2. **Propylene.**—Propylene is reacted with hydrochloric acid to form isopropyl chloride.

Benzene is alkylated with propylene from isopropyl benzene, from which alpha methylstyrene is derived by dehydrogenation. Alpha methylstyrene is used in copolymers, resins, and plasticizers.

Propylene oxide, another derivative of propylene, is made by a method similar to the one used in the manufacture of ethylene oxide.

Propylene is chlorinated to propylene dichloride, from which allyl chloride is made by removal of the hydrochloric acid.

3. **Butadiene.**—Used in rubbers, and with styrene as a copolymer becomes latices and other copolymers.

4. **Chlorination of saturated hydrocarbons.**—Pure methane passes into gas phase chlorinators of either the photochemical or thermal type, where it is chlorinated stepwise to produce methyl chloride, methylene chloride, and some chloroform. After separation of hydrochloric acid, the hydrocarbons are fractionated by distillation.

Perchloroethylene is made by utilizing the heat of the chlorination reaction to crack the chlorinated hydrocarbons to perchloroethylene with the simultaneous formation of carbon tetrachloride. Raw materials can be hydrocarbons and partly chlorinated hydrocarbons of the methane, ethane, propane, or even higher series. The hydrocarbon is mixed with diluent vapors of chlorinated hydrocarbons and fed into a thermal reactor, where it is chlorinated and cracked simultaneously; distillation follows.

Carbide & Carbon Chemicals

Represented in chemicals market with nearly 300 products available in commercial amounts

A GIANT in petrochemicals is Union Carbide's Carbide & Carbon Chemicals Division. Throughout its 30-year history, the organization has pioneered in aliphatic chemicals manufacture and today it is a leader in the industry both in volume and diversity of products.

In the current chemicals market, Carbide is represented with nearly 300 products, available in commercial quantities. Of these, 30 or more are in the 1,000,000-lb per year class. Scores of other chemicals are produced in carload lots. All of them originate either directly or indirectly from natural gas and refinery gas.

Carbide's importance in synthesis of chemicals from petroleum gases stems from an early appreciation of research and careful attention to existing or potential uses for byproducts. In fact, the origin of its chemical division may be attributed to a scientific curiosity directed toward byproducts.

Early History

Prior to World War I, the Prest-O-Lite Co. became interested in developing a new synthesis process for acetylene which would free the company from outside purchases of calcium carbide. A research program was established at Mellon Institute and Dr. George A. Curme, Jr., was hired to head the project.

Dr. Curme and his group were soon producing laboratory quantities of acetylene by cracking oil in an electric arc. The process also yielded three interesting byproducts: ethylene, propylene, and butylene. But the acetylene project died before it reached

SOUTH CHARLESTON, W. VA.—One of the huge plants of Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corp.

commercial application, when Prest-O-Lite joined with Linde Air Products Co. and Union Carbide Co.—the latter a major manufacturer of calcium carbide.

Meanwhile, interest in the highly reactive olefin byproduct continued, and soon the chemists were synthesizing a number of basic chemicals in the laboratory. The potential commercial promise of this new tack interested management in the newly formed Union Carbide & Carbon Corp.

Within 3 years, project chemists had produced ethyl and isopropyl alcohols, ethylene glycol, ethylene dichloride, diethyl sulfate, and ethylene oxide. The prospect of successful translation of such laboratory production to commercial plant scale brought about the formation in 1920, of the subsidiary Carbide & Carbon Chemicals Corp.

Natural gas use.—Turning to natural gas as a source material, the newly formed company set up its first base of operations in the Elk River Valley of West Virginia, in a small natural-gasoline plant purchased from Clendenin Gasoline Co. From the natural-gas production which represented the principal item of purchase, technical men drawn from Carbide, Linde, and Prest-O-Lite proceeded to pool their complementary talents in the development of commercial processes from the formulas and procedures brought down from Pittsburgh.

Four Petrochemical Plants

The year 1925 marked the first commercial production of four products, and the move to expanded facilities at nearby South Charleston. Throughout the depression which followed, the South Charleston plant continued to expand, adding from 5 to 10 new products each year.

TABLE 1—HEAVY TONNAGE CHEMICALS PRODUCED AT FOUR CARBIDE PLANTS

Chemical—	Sources			
	South Charleston	Whiting	Texas City	Institute
Alcohols:				
Methanol	X	..	X	..
Ethanol	X	X	X	..
Isopropanol	X	X	X	X
Butanol	X	..	X	X
Ethylhexanol	X	..	..	X
Methyl amyl alcohol	X	..	..	X
Glycols:				
Ethylene	X	..	X	..
Diethylene	X	..	X	..
Propylene	X	..	..	..
Ketones:				
Acetone	X	..	X	X
Methyl isobutyl	X	X	..	X
Isophorone	X	X	..	X
Diisobutyl	X	..	..	X
Esters:				
Butyl acetate	X	..	X	..
Isopropyl acetate	X	..	X	..
Ethylene dichloride	X	..	X	..
Ethyl acetate	X	..	..	..
Ethyl acetoacetate	X	..	..	..
Glycol ethers:				
"Cellosolve"* solvents	X	..	..	..
"Carbitol"* solvents	..	..	..	..
Amines:				
Monoethanolamine	X	..	..	..
Diethanolamine	X	..	..	..
Triethanolamine	X	..	..	..
Ethylene amines	X	..	X	..
Miscellaneous:				
Ethylene oxide	X	X	X	X
Acetic anhydride	X	X	X	..
Di (2-ethylhexyl) phthalate	..	..	..	X
Butyraldehyde	X	..	..	X
Ethyl ether	X	..	..	..

*Trade-marks of U.C.C.

More plants.—Geographical expansion of operations began in 1935 when the Whiting, Ind., plant was placed on stream. The Whiting plant utilizes millions of cubic feet of cracked refinery gas produced at the adjoining 175,800-bbl. per day refinery of Standard Oil Co. of Indiana.

In 1941 a similar plant was placed in operation at Texas City, Tex., utilizing both natural gas and refinery gases purchased from Pan American Refining Corp. at its nearby 114,000-bbl. per day refinery. During the war, the company built and operated a butadiene plant for the Government at Institute, W. Va., down the Kanawha River from Charleston. That war plant was purchased by Carbide shortly after the war, and now comprises the company's fourth production point for a widening range of chemical products. On January 1, 1950, the corporation became the Carbide & Carbon Chemicals Division of the parent company.

To the general public and to the petroleum industry, Carbide & Carbon Chemicals Division is best known for the development of ethylene glycol as an antifreeze. In the chemical industry where it ranks as a youngster, the company rates as a major supplier of basic aliphatics, for a large volume of Carbide's products constitute raw materials for further chemical processing.

A number of these basic chemicals are included in Carbide's list of heavy volume chemicals, exceeding 1,000,000 lb. annually. Table 1 lists the principal volume products and the plants which produce them. The end uses are legion for these heavy-

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tonnage chemicals and the hundreds produced in carload and drum lots. They enter prominently into such catagories as vinyl plastics, plasticizers, solvents, antifreezes, cleaners, synthetic rubber, textiles, petroleum additives, lubricants, insecticides, and repellents. Their scope of use is now extending further, into the pharmaceutical and biological fields.

Widening Product Range

Postwar research is now contributing to a rapidly expanding range of new Carbide chemicals. Table 2 illustrates the faster pace at which the company is adding new products to the "available" list, in commercial quantities of 55 gal. or more. To the 24 new chemicals already in commercial production to date just for this year, Carbide lists 20 additional products in varying degrees of commercial development.

A new product termed allethrin exemplifies the impact which many of these recently synthesized chemicals may exert on the chemicals market. This synthetic may well revolutionize the insecticide industry by replacing the well-known active principles from pyrethrum. Should allethrin follow the familiar "higher volume-lower cost" trend which has characterized petrochemical development, it will represent one more contribution to the vast consumer benefits accruing from a progressive chemical industry based on petroleum.

TABLE 2—CHRONOLOGY OF AVAILABILITY OF "CARBIDE" PRODUCTS

(Year indicates approximate date when material was first available on commercial scale.)

1925—"Cellosolve," ethylene chlorhydrin, ethylene dichloride, ethylene glycol.
1927—"Cellosolve" acetate.
1928—"Carbitol," butyl "Carbitol," butyl "Cellosolve," diethylene glycol, triethanolamine, triethylene glycol.
1929—Acetone, dichlorethyl ether, dioxane, ethylene oxide, isopropanol, methyl "Cellosolve."
1930—"Carboxide" fumigant, ethyl alcohol, ethyl ether, isopropyl ether, methyl alcohol.
1931—n-butyl acetate, n-butyl alcohol, butyraldehyde, propylene chlorhydrin, propylene dichloride, propylene glycol, propylene oxide.
1932—Acetoacetanilide, diethyl sulfate, diethanolamine, methyl acetone, monoethanolamine, ethyl acetate, ethyl acetoacetate, methyl acetate.
1933—Acetic anhydride, butyric acid, isopropyl acetate, methyl amyl alcohol, methyl amyl acetate, methyl isobutyl ketone.
1934—n-butyl ether, ethylbutanol, ethylhexanol, ethylhexyl acetate, hexanol (normal).
1935—Diethylene triamine, ethylene diamine, ethyl silicate, morpholine, triethylene tetramine.
1936—Dichloracetoacetanilide, methyl acetoacetate, o-chloracetoacetanilide.
1937—Benzyl "Cellosolve," butyl "Carbitol" acetate, "Carbitol" acetate, condensed ethyl silicate, diisobutyl ketone, diisopropanolamine, dioctylamine, dipropylene glycol, ethyl butyric acid, heptadecanol, isopropanolamine, methyl amyl ketone, methyl "Carbitol," methyl "Cellosolve" acetate, phenyl "Cellosolve," oxyfume, "Tergitol" penetrants 08, 4, 7, tetradecanol, thiodiglycol, triethylene glycol dichloride, triisopropanolamine, undecanol.
1938—Acetonylacetone, n-caproic acid, "Cellosize" hydroxyethyl cellulose, diethylaminoethanol, diacetone alcohol, diethyl "Carbitol," diethyl "Cellosolve," ethylbutyraldehyde, ethylhexaldehyde, ethylhexoic acid, ethylphenyl ethanolamine, ethyl propylacrolein, "Flexol" plasticizer 3GO, glycol diacetate, n-hexaldehyde, hydroxyethyl ethylene diamine, mesityl oxide, methyl amyl carbinol, propionic anhydride, phenyl diethanolamine, phenyl ethanolamine, propylene diamine, tetraethylene pentamine, isophorone.
1939—Butylamine, butyric anhydride, "Carbic" anhydride, "Carbowax" 1500 and 4000, dibutylamine, dichlorisopropyl ether, dioctyl phthalate (Flexol DOP), hexaethylene glycol (PEG 300), maleic anhydride, methyl propyl carbinol, polypropylene glycols, piperazine, tetraethanolammonium hydroxide, tetraethylene glycol.
1940—Amine 220, dichlorethyl formal, glycol diformate, hexyl ether, m-tolyl diethanolamine.
1941—Acetoacet-o-toluidide, butyl chloride, dimethyl ethanolamine, glyoxal, methyl "Cellosolve" acetal, methoxy triglycol acetate.
1942—2-ethylhexanediol, methyl diethanolamine, "Ucon" lubricants, polyethylene glycol 600, "Tergitol" 4 slurry, pentanedione, trichlorethane.
1943—Methoxy polyethylene glycols 370 and 550.
1944—Allyl alcohol, trimethyl cyclohexanol.
1946—"Flexol" plasticizer 8N8, allylidene diacetate, di (ethylhexyl) ethanolamine, N-acetylethanolamine, "Flexol" TOF, methyl pentanediol, dipropylene triamine, "Flexol" plasticizer 8HP, monoethylhexylamine, dimethylisopropanolamine, phenyl "Carbitol," methyl morpholine.
1947—2-methyl pentanol-1, "Carbowax" PF-45, butoxy triglycol, ethoxy triglycol, ethyl butyl ketone, "Tergitol" EH, "Tergitol" P-28, "Unox" fire-fighting penetrant, o-tolylethanolamine, amine 230, amine EL, fungicide 341 (slurry), pyruvic aldehyde, sorbic acid.
1948—"Flexol" TWS, "Flexol" R-1, diethyl maleate, succinic acid, diisobutyl carbinol (nonyl alcohol), acetophenone, trimethylnonanol, monoisopropylamine, diallyl maleate, methoxypolyglycol 750, acetoacet-o-anisidide, acetoacet-p-phenetidide, fly repellent No. 1, "Crag" fungicide 658, experimental fungicide 974.
1949—Ethyl acrylate, vinyl chlorethyl ether, diethyl amine, triethyl amine, aminopropyl morpholine, "Flexol" CA-6, "Flexol" DHP, "Flexol" 3CF, hexyl "Cellosolve," butanediol, dibutyl maleate, dehydranone, phenyl methyl carbinol, polypropylene glycols 425 and 2025, "Tergitol" TMN 650 and NPG 101, dichloral urea, tetrahydrophthalic anhydride.
1950—Allyl cinerin, NN-diethyl ethylene diamine, diethylpropanediol, ethyl n-butyl ether, mixed decanols, nonyl acetate, polyethylene glycol chloride 610, diglycol amine, diglycol diacetate, "Flexol" A-28, methyl ethyl pyridine, 2-ethyl-2-butyl propanediol-1,3, phenyl methyl ethanolamine, polyethylene glycol amine 175, ethyl hexyl acrylate, acetoacet-p-chloranilide, acrolein, vinyl 2-ethylhexyl ether, butyl acrylate.

Oronite Chemical Co.

Products manufactured by this California Standard subsidiary range from detergents to silicates

IN recognition of the growing importance of new synthetic chemicals and byproducts of petroleum refining, Standard Oil Co. of California created a new subsidiary in 1943 to handle the development and sales of chemicals. This subsidiary is Oronite Chemical Co. An aggressive research and product diversification program has been followed in the 7 years of its existence. Result has been a gradual shift of importance from the byproduct materials to the new synthetics in a rapidly expanding list of chemicals.

Detergents and Intermediates

Perhaps the most important of the Oronite products now being marketed are the synthetic detergents and detergent intermediates. Their production and sale has boomed in the postwar years, with the growing popularity of detergents for washing machines and the dishpan, as well as for industrial uses.

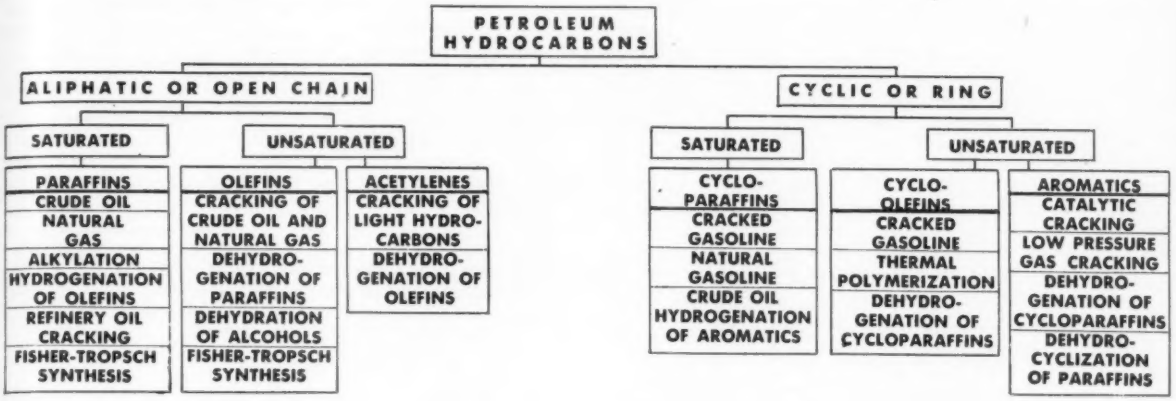
Plants for the production of the detergent materials are large units involving a multimillion-dollar investment. The processing techniques are continuous, and similar to those common in petroleum refining, with the attendant advantages of high volume and low-unit-cost production. These facilities have recently been expanded to meet a still-growing demand for this type of product.

Other.—Among the other important chemicals handled by Oronite are naphthenates which are used as paint driers; phthalic anhydride, derived from ortho xylene for use in surface coatings, and additives for lubricating oils.

Recent products.—In addition to these, Oronite has announced development of two new products within the last year. The first of these was a new, highly potent gas odorant, which was put on the market after 5 years of intensive research and a year of field tests. This odorant is being manufactured at Oronite's Oak Point, La., plant.

The second development, announced only a month ago, was of a new group of organic silicates which remain liquid over a temperature of —100° to more than 700° F., making them suitable for a great variety of uses.

These silicates are not yet commercially available, but among their many promising applications are use as heat-transfer liquids, lubricants, surface coatings, and polishes.



Chemicals From Natural Gas and Petroleum

More than half a million organic compounds can be synthesized from these two abundant raw materials

by Gustav Egloff*

USE of natural gas and petroleum for the manufacture of chemical derivatives is a development of the last 25 years. In 1925, 150,000 lb. of chemicals, principally isopropyl alcohol, were made from petroleum hydrocarbons. Today, over 3,000,000,000 lb. of natural gas and petroleum compounds are being used yearly for the manufacture of chemicals. The petrochemical industry has now progressed to the point where it supplies about 40 per cent of the organic chemicals manufactured in the United States. While the volume of petroleum used as a basis for chemicals is small in comparison to the amount used for fuels and lubricants, amounting to less than 0.5 per cent of total crude-oil and natural-gas production, the products are of high unit value and are supplementing or displacing organic compounds from other sources.

Natural Gas

Natural gas is the simplest source of hydrocarbons because it consists of relatively few compounds, and they are fairly easily separated. The average natural gas contains 75 to 85 per cent of methane though this percentage varies from 10 to 100 in gases from different parts of the world. Ethane, propane, and the butanes occur in decreasing amounts, and in the so-called "wet" gases there are pentanes, hexanes, heptanes and even the vapors of cyclopentane, cyclohexane, and benzene.

Natural gases frequently contain large amounts of hydrogen sulfide which may constitute 6 to 8 per cent by volume of the gas. Many gases contain commercially recoverable quantities of carbon dioxide for the manufacture of dry ice. Helium is occasionally an important constituent, though at the present time gases containing this rare element appear to be confined to certain United States fields in Kansas and Texas. The United States produces and consumes at the present time about 7,800,000,000,000 cu. ft. of natural gas a year of which less than 10 per cent is used for the manufacture of carbon black and chemicals.

Synthetic Hydrocarbons

Natural gas and petroleum are relatively deficient in some types of hydrocarbons such as olefins, and the paraffin hydrocarbons are not highly branched. Aromatic hydrocarbons are present in only minor percentages in the average petroleum. Fortunately, however, the petroleum refinery now has processes available for converting paraffinic and naphthenic hydrocarbons into olefins, isoparaffins, and aromatics so that any type of hydrocarbon needed for fuel purposes or chemical manufacture can be produced from available raw material.

Cracking of oil.—The gasolines from cracking may contain from 10 to 75 per cent olefinic hydrocarbons and in many cases up to 50 per cent aromatic hydrocarbons, particularly when cracking is conducted under relatively high temperatures and low pressures so that vapor-phase conditions prevail. The utilization of the hydrocarbons in cracked gasolines as source material for chemicals is progressing slowly because of the difficulties inherent in separating individual hydrocarbons from complex liquid mixtures.

The gases from catalytic cracking are rich sources of hydrocarbons for chemical manufacture. They contain large quantities of olefinic hydrocarbons including ethylene, propylene and normal butylene, and isobutylene as well as the paraffins methane, ethane, propane, normal butane, and isobutane which can either be converted to olefins by cracking or dehydrogenation or utilized individually for chemical production.

Cracking of gases.—Ethane and propane are now thermally cracked to produce ethylene. From ethane yields of 60 per cent ethylene are obtained and from propane about 50 per cent. In the autothermic process, the heat for cracking ethane or propane is furnished by the partial internal combustion of the gases. Ethylene is not only an important base for manufacture of chemicals, but is used directly as an anesthetic and for ripening fruit.

Acetylene is another important unsaturated hydrocarbon which is produced by the high-temperature cracking of hydrocarbons. The best yields are obtained at the temperatures of the electric arc, though the use of refractory regenerative furnaces and autothermic processes are practical.

Dehydrogenation of paraffins.—By

*Universal Oil Products Co., Chicago. Paper given before Techniques et Applications du Petrole et Toutes Energies, Paris, 1950.

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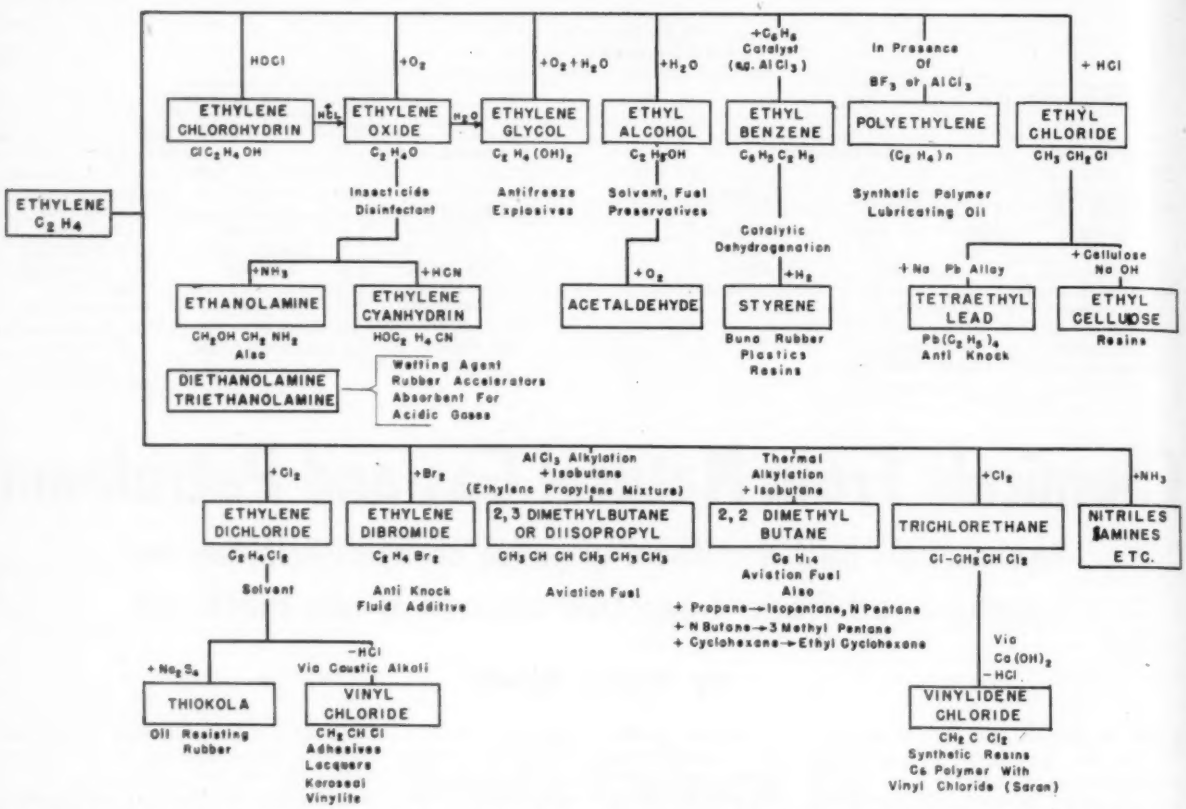

***COMMERCIAL ETHYLENE DERIVATIVES.**—This chart and that on the preceding page prepared by C. W. Perry, Phillips Chemical Co., Bartlesville. (For associated paper on this subject by author, see Journal issue of September 29, 1949, p. 66 et seq., and also paper by W. R. Pierce and C. W. Perry in Journal issue of May 4, 1950, pp. 138-141.)*

dehydrogenation of butanes, a whole series of products are currently manufactured. From normal butane, catalytic dehydrogenation produces n-butylene in a first stage and butadiene in a second stage. The dehydrogenation of isobutane yields isobutylene for synthetic processes. Similarly, various pentadienes are obtained by the catalyzed dehydrogenation of pentanes. Isoprene by the dehydrogenation of isopentane is of particular importance.

Dehydrogenation of cycloparaffin.—Catalytic dehydrogenation reactions make possible the production of aromatic hydrocarbons from the corresponding cycloparaffins. Thus, benzene is recovered in high yields by dehydrogenating cyclohexane, and toluene is made similarly from methyl cyclohexane. During the last World War, enormous quantities of toluene, about 300,000,000 gal. a year, were made from petroleum fractions.

Polymerization.—Both thermal and catalytic polymerization reactions are commercially employed to produce new types of hydrocarbons. Extensive polymerization produces C_{12} olefins, lubricating oils, and resinous materials. The polymerization of isobutylene produces an additive for improving the viscosity index of lubricating oils, and a resinous material known as vistanex.

The polymerization of ethylene to compounds of high molecular weight produces the resin polythene which is specially suitable for the insulation of electric cables. The polymerization of styrene, made by alkylating benzene with ethylene and then dehydrogenating the ethyl benzene produced, forms a series of polystyrene resins. Most of the synthetic rubbers are hydrocarbon polymer products, the commonest and most extensively manufactured tire rubber being a copolymer of styrene and butadiene. Butyl rubber, which is so well adapted to the manufacture of inner tubes, is a copolymer of isobutylene and isoprene.

Alkylation.—Alkylation of both isoparaffin and aromatic hydrocarbons with olefins is carried on commercially. In the case of isoparaffins, the alkylate which contains isohexanes, isoheptanes, and isooctanes is used mainly as an ingredient of gasoline, but aromatic alkylates are important as sources of chemicals. Aromatic hydrocarbons are generally more easily alkylated than isoparaffins. Ethyl benzene is produced by reacting benzene with ethylene using aluminum chloride-hydrocarbon addition complexes as catalysts. Similarly, cumene is produced by the catalytic alkylation of benzene with propylene, and various secondary and tertiary derivatives are made by using butylenes.

Separation processes.—Separation techniques are highly developed for recovering individual hydrocarbons either from natural gas and petroleum or from hydrocarbon mixtures resulting from various hydrocarbon syntheses. Fractional distillation has been developed to a high degree of efficiency, and use of a third component (azeotrope) is commonly employed to enable sharper separations. Fractional crystallization is frequently employed to separate hydrocarbons from complex mixtures. The art of selective solvent extractions is also highly developed.

Solid adsorption techniques are also available for the selective removal of aromatic hydrocarbons from mixtures. Occasional use is made of salts which form additional compounds with certain types of hydrocarbons. This procedure is followed in the separation of butadiene from cracked gases by using copper salts and subsequently

heating the addition product to recover the butadiene.

Preparing Derivatives

In manufacturing chemical derivatives either from hydrocarbons or other compounds separated directly from natural gas or petroleum or made by synthetic processes, all of the usual primary chemical reactions are employed.

Oxidation of hydrocarbons is employed to produce acids, aldehydes, ketones, and alcohols. The scope of oxidation processes has grown so rapidly in the last decade that new plants of large capacity for making oxygen from liquid air have been required. Many hydrocarbon oxidation processes use a 95 per cent oxygen gas which has proved more economic than the more expensive pure oxygen.

Halogenation is employed for both addition and substitution reactions. In recent years, fluorine has also been employed to produce a series of fluorocarbons in which hydrocarbon hydrogen is partially or completely substituted by fluorine.

Sulfonation reactions give rise to a large number of important primary and finished products. Paraffinic, olefinic, naphthenic, and aromatic hydrocarbons are all reacted with different strengths of sulfuric acid to produce sulfo derivatives.

Nitration is extensively employed to produce nitro compounds which in turn are reduced to amines.

The number of chemical derivatives which can be produced from natural gas and petroleum is almost endless, so that a complete recounting would be a review of organic chemistry. In the succeeding sections, typical products and their methods of manufacture will be cited.

Organic Acids

Oxygen-containing acids are both recovered directly from petroleum and cracked products and produced by catalyzed or uncatalyzed oxidation reactions. From some petroleums, naphthenic acids are extracted by alkaline hydroxides. In the United States, 25,000,000 lb. are produced annually. Their chief use is in fungicides and preservatives.

The alkali metal salts are used as ingredients for soap. Some of the metal naphthenates are used in high-pressure lubricants and rust preventives. Copper and zinc naphthenates are used as paint dryers and in treating textiles to render them resistant to mold and mildew. Naphthenates of chromium, iron, lead, manganese, and mercury are all commercial products.

Cresylic acids are present in straightrun and cracked naphthas, from which they are recovered by alkaline extraction. These compounds are used in resins, surface coatings, gum inhibitors, mineral flotation agents, metal cleaners, solvents, and insecticides. Succinic acid is manufactured from ethylene by the successive steps of chlorinating, cyanizing and hydrolyzing.

Direct oxidation of petroleum hydrocarbons produces a series of products including aliphatic carboxylic acids. By the direct oxidation of natural-gas paraffins, formic and acetic acids are produced. Higher-molecular-weight acids are produced from paraffin wax. The acids produced from wax are used to make synthetic fats by reacting them with glycerin.

A plant is now in operation which produces phthalic anhydride by the oxidation of orthoxylene obtained from a reformed naphtha. This plant is producing 8,000,000 lb. annually to augment inadequate supplies made by oxidizing coal-tar naphthalene. The annual production of phthalic anhydride from all sources is now about 180,000,000 lb.

Alcohols

Petroleum and natural-gas hydrocarbons furnish the basis for the manufacture of mono, di, and tri alcohols. Methanol is produced from methane by oxidation and the Fischer-Tropsch process. The synthetic product from natural gas or coal has almost completely replaced that made from wood distillation. Wood distillation was the only source of methanol in 1925. In 1930, out of a total production of 76,000,000 lb., 66 per cent was synthetic. By 1948, total methanol production had reached 990,240,000 lb. of which 97 per cent was the synthetic product. In 1948, 77 per cent of the synthetic methanol production was from natural gas and only 23 per cent was based on coal.

Ethyl alcohol is produced from ethylene by first producing ethyl-hydrogen sulfate and then hydrolyzing. Of the 160,000,000 gal. of alcohol produced in 1948, 70 per cent was synthesized from ethylene and 30 per cent came from various fermentation processes. It has been calculated that if the ethyl alcohol now synthesized from ethylene were to be produced from grain by fermentation it would mean the cultivation of an additional 1,600 sq. miles of farm land. Processes are being developed for producing ethyl alcohol from ethylene by direct hydrolysis without going through the intermediate acid sulfate stage.

Seventy-five million gallons of isopropyl alcohol are produced annually in the United States. This alcohol is a unique petroleum product, since it is produced from propylene in cracked gases and there is no other source of this hydrocarbon. Normal propyl alcohol is made by oxidizing propane to propionaldehyde and reducing to the alcohol. Difficulties are encountered in using the sulfate-hydrolysis method for making aliphatic alcohols containing more than four carbon atoms. In the recently developed Oxo process, such higher alcohols are made from liquid olefins by treatment with carbon monoxide-hydrogen mixtures under pressure in the presence of special catalysts. By this type of reaction octyl and nonyl alcohols are being produced commercially.

Glycols

Among the important products made from petroleum hydrocarbons are the glycols. The most important of these is ethylene glycol which is used principally as an antifreeze for automobile radiators. There are two commercial processes for making this compound. In one, ethylene is reacted with hypochlorous acid to produce ethylene chlorhydrin and this is subjected to alkaline hydrolysis to produce glycol. In another, ethylene oxide is produced from ethylene by direct oxidation and this compound is hydrolyzed to the desired product. Three hundred and seventy million pounds of ethylene glycol were manufactured from ethylene in 1948, 70 per cent of which was used as antifreeze liquid.

From ethylene glycol, a number of other products are made. By polymerization, a high-molecular-weight polymer is obtained which has lubricating properties and is at the same time water soluble so that it is adapted to lubricating rubber molds and textile machinery. The cellulose plastics are made by reacting glycol with cellulose. A hexylene glycol now is in production which is used in cleaning compounds, soluble oils, and soaps for dry cleaning. It is also used as a homogenizer inlubricating and cutting oils and as a component of hydraulic fluids.

Glycerin

One of the outstanding industrial developments of the past decade has been the commercialization of the synthetic glycerin process. After a long period of research, glycerin is now made in amounts up to 35,000,000 lb. a year from propylene in cracked gases. The initial reaction involves the high temperature (500° C.) substitutive chlorination of propylene. The next step is the formation of allyl alcohol, followed by hydrochlorination of this compound and finally alkaline hydrolysis to glycerin

Importance of the synthetic glycerin processes can hardly be overestimated. The world fat shortage is still severe and in addition less glycerin is being made from fats as a by-product of soap manufacture because of the inroads of synthetic detergents on the soap industry. Synthetic

glycerin has released many millions of pounds of fat for use as food.

Ethers and Esters

The alcohols, glycols, and glycerin are used for the manufacture of ethers and a wide variety of esters. Of particular importance are the compounds known as cellosolves which are alkyl ethers of the ethylene glycol. These form a series of solvents which have wide industrial use. The synthesis of glycerin from propylene gives rise to a large number of important byproducts. Among these is allyl alcohol, which is a special soporific. The various alkyl esters of allyl alcohol have value as perfumes.

A new textile material known as terylene which is being developed in Great Britain is essentially an ester of glycerol and terephthalic acid.

A new inhibitor for preventing the development of rancidity in fats has recently been manufactured by alkylating anisole with isobutylene. The compound is an ether, its chemical name being 2-tert-butyl-4-methoxyphenol (Sustane).

Aldehydes

The oxidation of natural gas and petroleum hydrocarbons give rise to a considerable number of aldehydes. In the oxidation of natural gas, the principal aldehydes produced are formaldehyde and acetaldehyde. The formaldehyde is used as a disinfectant and germicide, in the manufacture of bakelite resins and in the production of tetrahydrofuran by reaction with acetylene. This last compound is of special value as a solvent since it dissolves rubber, polystyrene, and the vinyl and cellulose plastics.

Acetaldehyde is a base for the production of aldols and acetals. The aldols are chemical intermediates for the manufacture of glycols, unsaturated aldehydes and ketones, and betahydroxy acids. The acetals can be used as solvents and the cyclic acetals, dioxolanes, and dioxanes are useful in making resins.

Other aldehydes in commercial production are propionaldehyde, and acrolein made by cracking diallyl ether, a byproduct of the synthetic glycerin process. The Oxo process already mentioned as a source of high-molecular-weight aliphatic alcohols, produces aldehydes as intermediate products.

Ketones

Acetone, the most widely used compound of this class, is now produced by catalytically dehydrogenating isopropyl alcohol. In 1948, 428,000,000 lb. were produced in this way, and 27,000,000 lb. by fermentation. By a similar reaction, methyl ethyl ketone is produced from secondary butyl alcohol made from normal butylene. Acetone forms the basis for the production of diacetone alcohol which in turn is used for making mesityl oxide. Methyl ethyl ketone is used extensively in oil refining to separate paraffin wax from lubricating oils.

Halogen Derivatives

An extremely large number of intermediate and finished products are made from hydrocarbons by the use of chlorine and other halogens in primary, intermediate, or final reactions. By control of temperature, chlorination reactions may be additive or substitutive. By chlorination of natural gas, all four substitution products of methane are produced: methyl chloride, methylene dichloride, chloroform, and carbon tetrachloride. The refrigerating fluid known as freon is difluorodichloromethane. Ethylene adds a molecule of chlorine to form ethylene dichloride.

Hydrogen chloride and ethylene react to give ethyl chloride which is used in the manufacture of tetraethyl lead so that the petroleum industry assists in producing one of its most valuable gasoline additives. Similarly ethylene and bromine yield ethylene dibromide, an essential constituent of ethyl fluid which prevents pitting of exhaust valves. Ethylene dichloride is a base material for the production of the chemical-resistant thiokol rubber made by reaction with sodium polysulfide.

Chlorinated paraffin waxes have many industrial uses. They are used in flameproofing compounds, as components of extreme-pressure lubricants, and in cutting and drawing oils. They are also employed in treating textiles to render them flame resistant and both water and mildewproof.

The chlorhydrins are an important group resulting from the action of hypochlorous acid on olefins. The ethylene compound is a byproduct of glycol manufacture and epichlorhydrin is an intermediate in the manufacture of glycerin. Another glycerin intermediate is allyl chloride, a product of the primary high temperature chlorination of propane - propylene mixtures. The soil fumigant D-D, a mixture of the dichlor substitution products of propane and propylene, is also a byproduct of the synthetic glycerin process.

Many of the new miracle insecticides are halogenated hydrocarbons, for example, D.D.T. 1,1,1-trichloro-2,2,-bis (p-chlorophenyl)-ethane and gammexane, 1,2,3,4,5,6-hexachlor cyclohexane. Over 18,000,000 lb. of the former and 16,000,000 lb. of the latter were manufactured in 1948. All of the necessary reagents for the manufacture of these compounds, with the exception of chlorine, are obtainable from petroleum.

Neoprene rubber is a polymer of chloroprene, chemically known as 2-chloro-1,3-butadiene. This rubber is adapted to very special uses because it is resistant to heat and to oils. It can also be made into very hard rubber.

Sulfur Derivatives

While the procedure is not general, large quantities of sulfur and sulfuric acid are made from the hydrogen sulfide present in natural and refinery gases. In making sulfur a third of the sulfur in the hydrogen sulfide is burned to sulfur dioxide in the primary stage and this is reacted with the remaining hydrogen sulfide in a second stage to form sulfur and water. At other times, the hydrogen sulfide is completely oxidized and the resulting sulfur dioxide is catalytically converted to the trioxide and thence to sulfuric acid.

Mercaptans occurring in cracked gasolines produced from sulfur-containing oils are used commercially for odorizing domestic fuel gases. Dodecyl mercaptan is used in the manufacture of synthetic rubber. Dialkyl disulfides are also recovered. By reacting ethyl mercaptan with dimethyl ether and oxidizing the products, the drug sulfonal is produced. Dimethylsulfolane is being produced commercially from petroleum. The sulfolanes are particularly valuable as solvents because of their noncorrosive character, selectivity, and chemical inertness. A special product for protecting tender plant leaves from the attack of insects is known as polyethylene polysulfide. Solutions of this compound sprayed on plants form a thin film which does not shut out light and enables the plant to grow unharmed by the ravages of insects.

Two sulfur compounds are manufactured from petroleum hydrocarbons by rather unusual reactions. The action of sulfur on methane is now used to produce carbon disulfide, and thiophene is produced from normal butane and sulfur.

The recently developed surface-active detergents are some of the most important sulfur - containing derivatives of petroleum hydrocarbons. These are made by sulfonating paraffin, olefin, and aromatic hydrocarbons or forming sulfuric acid esters with petroleum derived alcohols, followed by neutralization with alkalis. The alkyl chains in these compounds ordinarily contain 12 to 18 carbon atoms. One of the alkylating olefins is a tetramer of propylene.

The group of detergents produced in greatest volume consists of the alkyl aryl sulfonates which comprise around 40 per cent of total production. About 400,000,000 lb. of surface-active detergents are now being produced annually in the United States, which corresponds to about a billion pounds of synthetics. Many sulfonated

(Continued on page 81)

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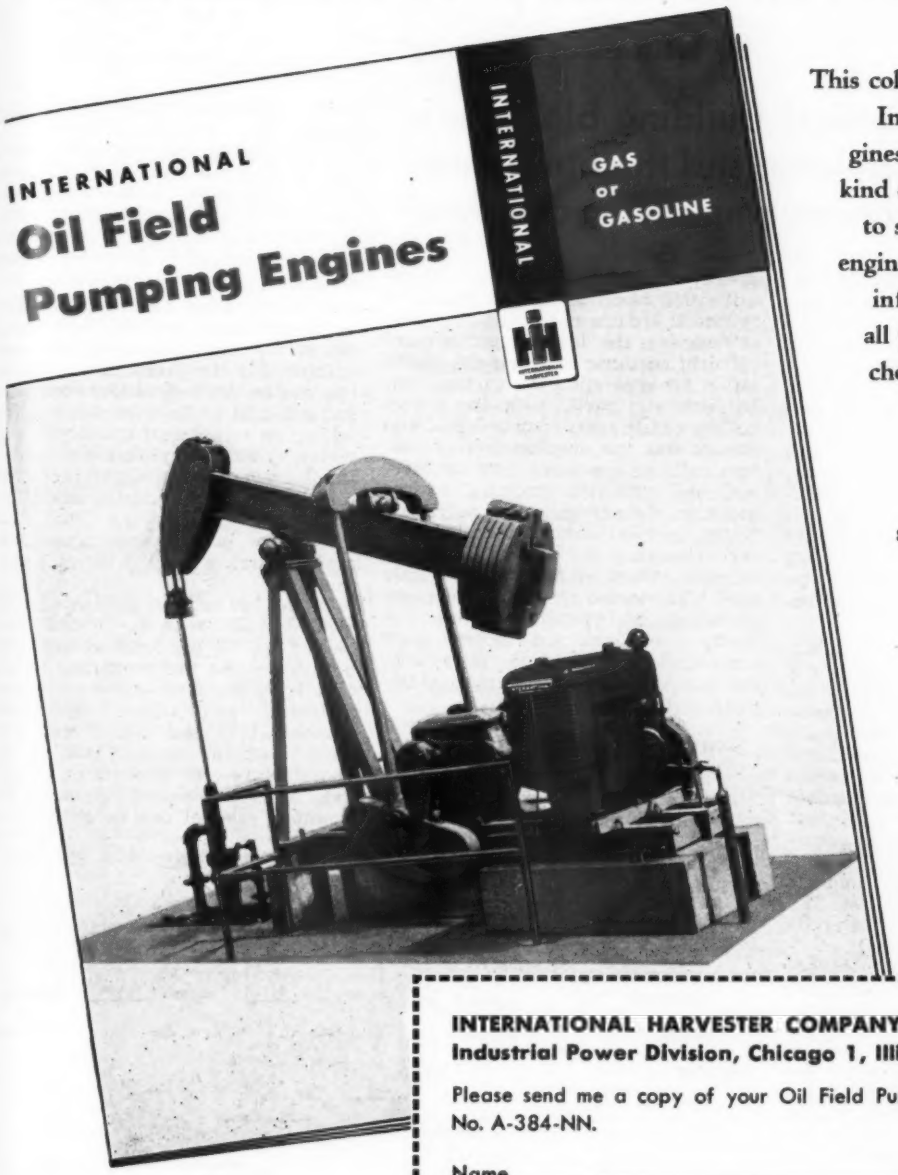

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Progress in Petrochemistry—A Technical Report

by William J. Sweeney*

Important chemical building blocks are ethylene, propylene, and the butylenes, as shown in the accompanying diagrams

ABOUT 25 years ago, chemicals from petroleum, oftentimes called petrochemicals, accounted for only a negligible portion of our national economy. At that time the production of chemicals from oil amounted to a mere 75 tons per year, the major portion of the organic chemicals coming, of course, from coal tar, wood, and certain fermentation processes. Chemists and petroleum technologists realized, however, that the numerous hydrocarbons abundantly available in the products of our oil wells would ultimately provide the basis for a new organic chemical industry.

Today, we have just such an industry which produces approximately 2 million tons of raw materials (exclusive of aromatics) for synthetic organic chemicals yearly. Petroleum and natural gas are now considered very important sources of numerous organic raw materials which cannot be obtained, at least in sufficient quantity, from other naturally occurring products or which can be produced from such natural products only at a somewhat higher cost. The availability of these raw materials derived from petroleum greatly stimulated the development and manufacture of many new organic chemicals and chemical intermediates. At present, petroleum can supply the raw materials for nearly every product desired by the organic chemical industry and, consequently, petrochemical manufacture will be limited only by the economics and demand for the chemicals produced and not by the supply of raw materials.

Crude oil is, of course, a very complex mixture of hydrocarbons containing all the way from one to hundreds of carbon atoms and of wide boiling range. Because of its complex nature, crude oil, as such, is of little value in chemical synthesis operations. Two major developments greatly stimulated interest in the utilization of crude oil as a source of synthetic organic chemicals. The first of these was the development of more efficient methods of fractional distillation for separating the various constituents and particularly the lower-boiling constituents of petroleum. The second was the development of certain refining processes such as thermal and catalytic cracking, hydrogenation, dehydrogenation, polymerization, isomerization, and alkylation for improving the quality of motor gasoline. Many of the raw materials used today in the synthesis of organic chemicals are byproducts of these refinery operations and include such compounds as ethylene, propylene, the butenes, pentenes, butadiene, toluene, xylenes, and so forth.

Conversion of Hydrocarbon Raw Materials

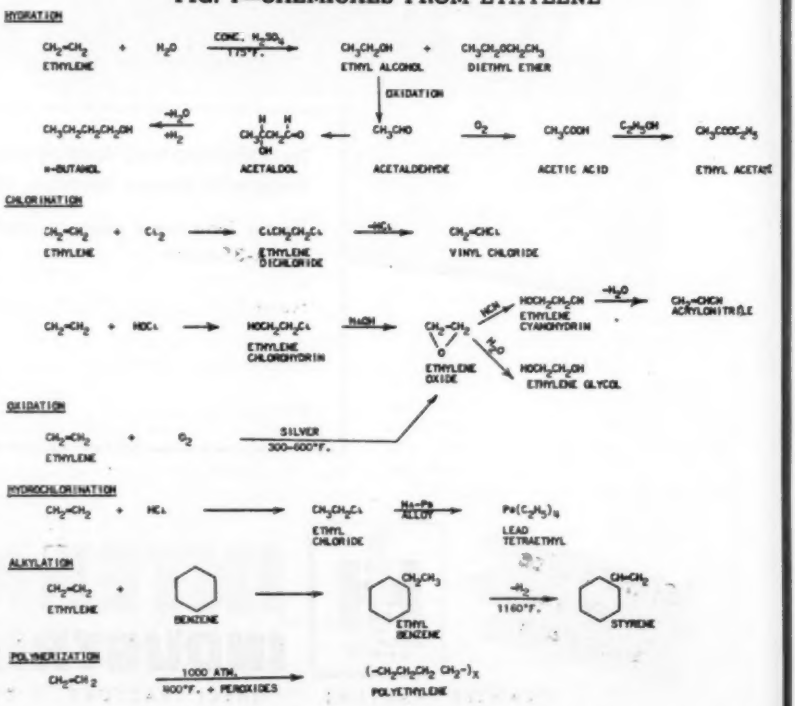
In addition to their conversion into motor fuels, these hydrocarbons are very important chemical building blocks.

Ethylene has long been considered one of the most important, if not the most important, hydrocarbon raw material for the petrochemical industry. A few of the reactions involved in its conversion to synthetic organic chemicals are shown in Fig. 1.

Synthetic ethyl alcohol is the largest single outlet for ethylene and is one of the major petrochemicals manufactured in the United States. Ethylene can be reacted with concentrated sulfuric acid to form an alkyl sulfate which, on subsequent hydrolysis with water, yields ethyl alcohol and a small amount of diethyl ether. This reaction is called hydration and it can also be conducted using a liquid phase catalyst or in the vapor phase with a solid catalyst (called direct hydration).

Of the 160 million gallons of ethyl alcohol produced in the United States each year, 70 per cent comes from petroleum and the remaining 30 per cent from the fermentation of grain, molasses, and other agricultural products. It is used as a solvent, antifreeze, rubbing alcohol, and in the manufacture of plasticizers, explosives, and other organic chemicals. For example, ethanol can be oxidized to

FIG. 1—CHEMICALS FROM ETHYLENE



*Vice president, research and development, Standard Oil Development Co., New York. This material from Twenty-fourth (1950) Annual Priestley Lectures, and published by special permission from the author and Phi Lambda Upsilon and Department of Chemistry, Pennsylvania State College. The complete treatise, "Petroleum and Its Products," is available from Department of Chemistry, Pennsylvania State College, State College, Pa., $2.25. (See "Book Reviews," Journal issue of June 15, 1950, page 116.)

acetaldehyde and subsequently to acetic acid (or acetic anhydride), the latter being esterified with ethanol to form the solvent ethyl acetate. Forty per cent of all ethanol production goes into acetaldehyde manufacture.

Acetic acid, about 400 million pounds, are produced annually in the United States and, of this amount, 75 per cent is derived from petroleum. Three-quarters of the total production is consumed (as acetic anhydride) in cellulose acetate and acetate-butyrate plastics or rayon manufacture.

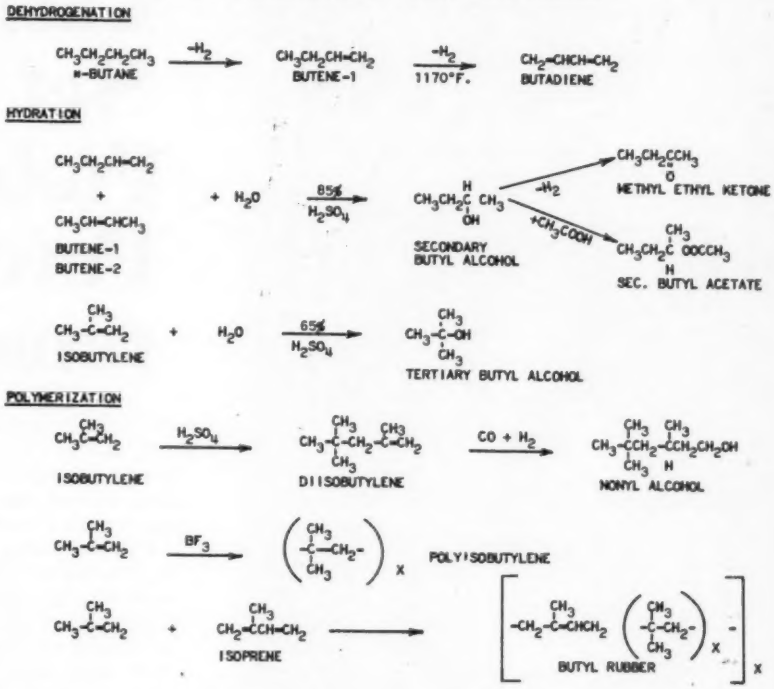
Butanol. — If acetaldehyde is catalytically aldolized, dehydrated, and hydrogenated, butyl alcohol is produced. This alcohol is employed in the form of its phthalate ester as a nitrocellulose-lacquer plasticizer.

Other Ethylene Products

Chlorination of ethylene yields the useful solvent ethylene dichloride which can be dehydrohalogenated to form vinyl chloride, the latter constituting an important resin and fiber raw material.

Treatment of ethylene with hypochlorous acid (in the form of chlorine and lime) results in the formation of ethylene chlorhydrin which is subsequently converted to ethylene oxide or ethylene glycol. Ethylene oxide can be reacted with HCN and the resulting ethylene cyanohydrin dehydrated to form acrylonitrile, the latter being employed in the manufacture of oil-resistant synthetic rubbers and the synthetic fibers orlon and vinyon N.

FIG. 3—CHEMICALS FROM BUTYLENES



Hydrolysis of ethylene oxide with water in the presence of dilute sulfuric acid yields ethylene glycol, a major petrochemical which is produced to the extent of 420 million pounds annualy. Two-thirds of this quantity is consumed in permanent-type antifreeze compounds with the remainder finding application in the preparation of alkyd resins, dynamite, solvents, and synthetic fibers.

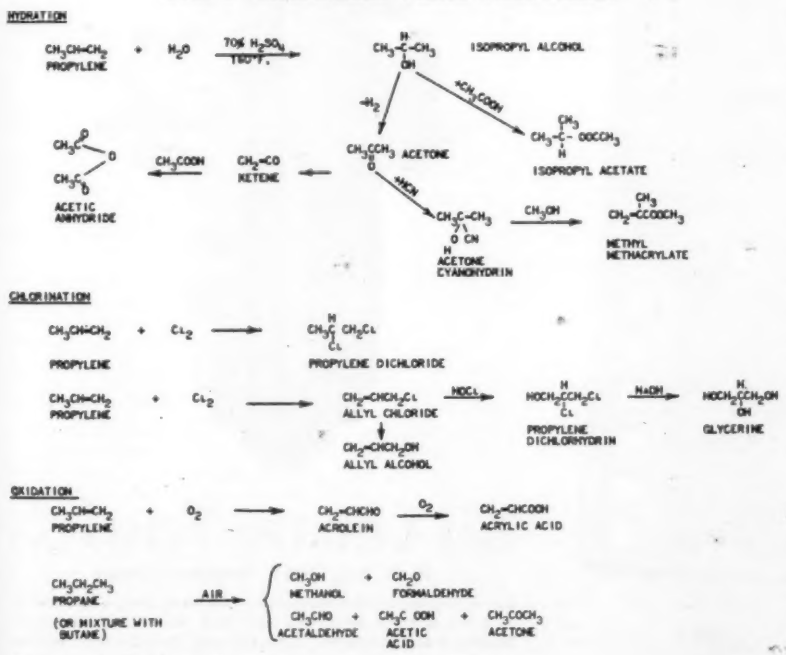
Ethylene oxide, a chemical useful in the preparation of high-boiling solvents and detergents, can also be produced by the direct oxidation of ethylene over a silver catalyst.

Ethylene is also reacted with hydrogen chloride to yield ethyl chloride which is subsequently treated with a sodium-lead alloy to produce tetraethyl lead, the well-known gasoline antiknock agent.

When benzene is alkylated with ethylene in the presence of a Friedel-Crafts catalyst, ethyl benzene is formed which is then dehydrogenated to produce styrene. Styrene is polymerized with peroxide catalysts to form the resin polystyrene and it is also copolymerized with butadiene to form the widely used synthetic rubber GR-S.

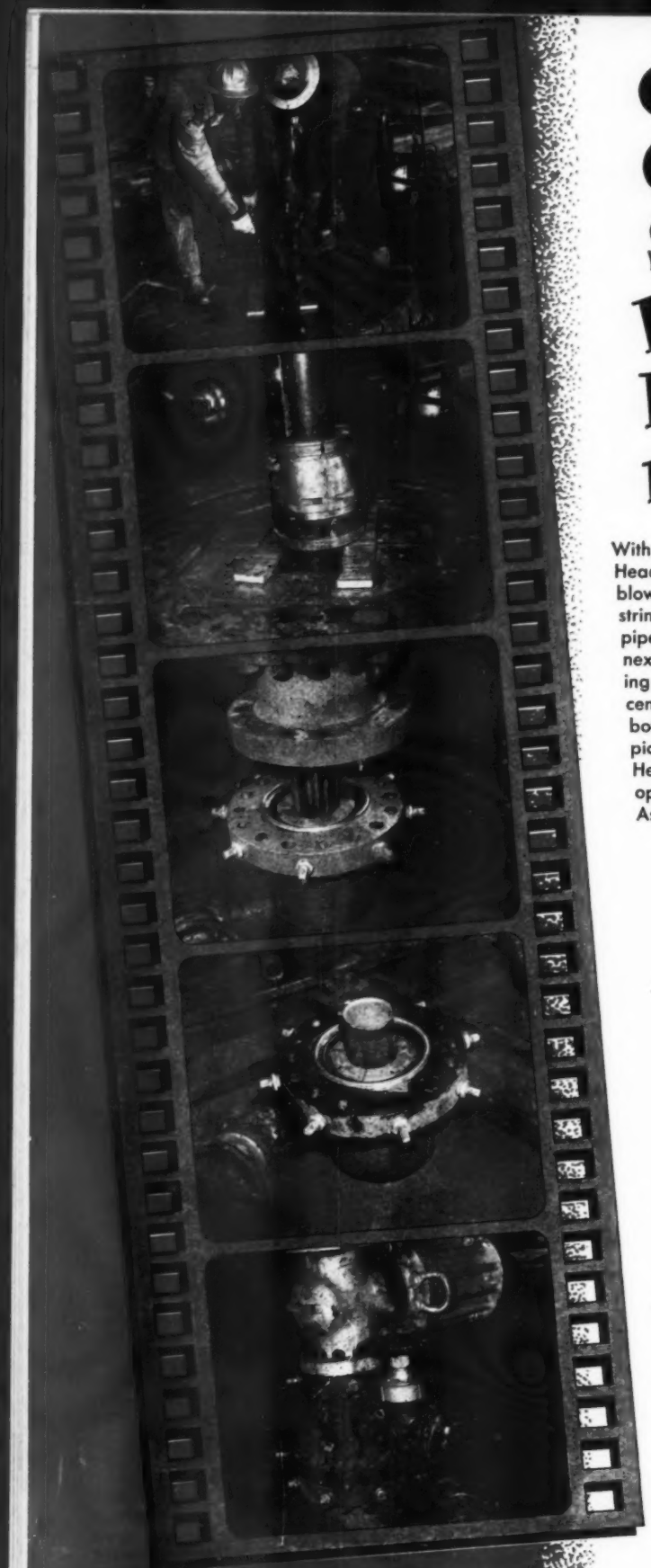
Finally, ethylene can be polymerized at high pressures, of the order of 1,000 atm., and at approximately 400° F. in the presence of oxygen or peroxides as catalysts, to form polyethylene which is a clear colorless plastic used to the extent of about 25,000 tons per year in wire insulation, packaging materials, molded articles, and the like.

FIG. 2—CHEMICALS FROM PROPYLENE



Products From Propylene

Turning now to propylene, this olefin undergoes more or less the same reactions as ethylene as shown in Fig. 2. It can be hydrated using 70 per cent sulfuric acid to form isopropyl alcohol and the total United



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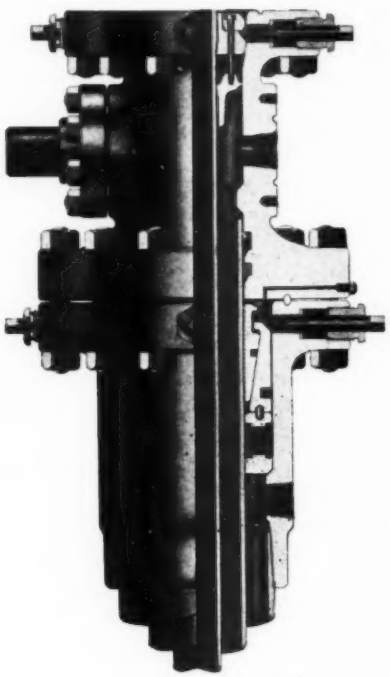

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States production of this alcohol namely 834 million pounds per year, is derived entirely from petroleum. In addition to its use as an antifreeze and solvent, isopropyl alcohol is esterified with acetic acid to form isopropyl acetate which is marketed as a resin and lacquer solvent.

Of major importance, however, is the dehydrogenation of isopropanol to yield acetone. Of the 455 million pounds of acetone produced yearly, about 94 per cent stems from isopropyl alcohol and the remainder from fermentation processes. Acetone is used as a cellulose acetate solvent, an extractant, and a chemical raw material. On reaction with HCN, it forms acetone cyanohydrin, which on dehyration, hydrolysis, and esterification with methyl alcohol, yields methyl methacrylate, the raw material for Lucite plastic production. Dehydrogenation or thermal-cracking of acetone results in the formation of ketene, the latter reacting with water or acetic acid to form acetic acid and acetic anhydride respectively.

Chlorination of propylene at low temperatures results in the formation of the solvent propylene dichloride or, if the chlorination is carried out at high temperatures (of the order of 900° F.), substitution rather than addition occurs and allyl chloride is produced. The addition of hypochlorous acid to allyl chloride forms propylene dichlorhydrin which is then hydrolyzed to synthetic glycerin. Up until the time this commercial process was developed, all of the glycerin consumed in this country was produced by the saponification of animal and vegetable fats and oils or by fermentation. Glycerol is presently being produced from petroleum in a single plant at the rate of 35 million pounds a year for use in alkyd resin synthesis.

As in the case of ethylene, the addition of hypochlorous acid to propylene permits the formation of a chlorhyrdin which is subsequently converted to propylene oxide and propylene glycol. On the other hand, when propylene is oxidized over a proper catalyst, acrolein is formed. Finally, the oxidation of propane or mixtures of propane and butane with air is another commercial operation yielding methanol, formaldehyde, acetic acid, acetaldehyde, acetone, and a number of other products.

Butylene Derivatives

As in the case of the other olefins discussed previously, the butylenes are present in the gases issuing from thermal and catalytic cracking operations. In addition, the normal butylenes are obtained by the catalytic dehydrogenation of normal butane, as indicated in Fig. 3. The latter process was used extensively during the war to produce butylenes which were subsequently dehydrogenated further to form butadiene. The butadiene was removed from other olefins by absorption in ammoniacal cuprous acetate solution or by extractive distillation, fractionated, and consumed to the extent of 661 million pounds (in 1948) in the manufacture of the general-purpose and oil-resistant synthetic rubbers. Annual production rate was over a billion pounds during the war when the demands for rubber were greater than they are at the present time and, during the war period, a portion of the butadiene was also derived from fermentation ethyl alcohol.

It might be mentioned also that a process has been developed recently for converting butadiene to the nylon synthetic-fiber raw materials. This involves chlorinating butadiene to form a mixed butene dichloride which is subsequently reacted with an alkali cyanide to yield the dinitrile. The dinitrile is finally hydrolyzed and adipic acid and hexamethylene diamine thereby obtained.

Butene-1 and butene-2 can be subjected to hydration in the presence of 85 per cent sulfuric acid to form the solvent secondary butyl alcohol which can be dehydrogenated to methyl ethyl ketone or esterified to form secondary butyl acetate. also a resin and lacquer solvent. Hydration of isobutylene with a weaker acid solution yields tertiary butyl alcohol. This alcohol can be dehydrated and isobutylene liberated, a process used in the purification of this olefin for subsequent rubber manufacture.

The polymerization products of isobutylene are of considerable significance from a chemical standpoint. Polymerization of isobutylene in the presence of sulfuric acid results in the formation of diisobutylene which can be added to gasoline for octane number improvement or hydrogenated to form isooctane. One of the most recent developments is the so-called "Oxo process" which comprises the reaction of higher-molecular-weight olefins, such as diisobutylene, with carbon monoxide and hydrogen at high temperatures and pressures to form higher primary alcohols. The C_9 and C_{10} alcohols produced in this manner find their major outlet in the form of their phthalic acid and adipic acid esters which are valuable resin plasticizers.

Aromatic hydrocarbons can also be alkylated with the C_{10} to C_{18} olefins, produced by polymerization of the lower olefins, and the alkylates then sulfonated to form detergents. The olefins can also be sulfonated by themselves and used as wetting agents and detergents. At the present time, detergent production, based on petroleum derived raw materials, amounts to about 1 billion pounds annually as compared to 3-3.5 billion pounds of soap.

Perhaps the most important chemical derivatives of isobutylene are the higher-molecular-weight polymers such as vistanex (or polyisobutylene) and butyl rubber. These will be discussed separately below.

Synthetic Rubbers

It is believed significant, and certainly no mere coincidence, that the growth of the petrochemical industry has closely paralleled the increase in the development and commercial production of synthetic rubbers, fibers, and plastics.

GR-S, perhaps the most widely used synthetic rubber (833 million pounds in 1948), is a copolymer of approximately 3 parts of butadiene and 1 part of styrene. The butadiene and styrene are copolymerized in a peroxide catalyzed emulsion process at 40°-125° F. to produce a synthetic rubber closely resembling natural rubber in its appearance.

GR-S is superior to natural rubber in resistance to aging although it is very similar in the properties of tensile strength, resilience, abrasion resistance, and elasticity. GR-S can be compounded with sulfur, accelerators, plasticizers, fillers, pigments, and the like and vulcanized in much the same manner as natural rubber. In reality, GR-S is a general-purpose synthetic rubber and, consequently, it finds application in the fabrication of many mechanical rubber products where natural rubber itself was employed in the past. During the recent war, and even at the present time, its major outlet is in the manufacture of tires for passenger automobiles where its performance characteristics are about equal to those of natural rubber. Tires containing both GR-S and natural rubber are superior to prewar tires.

"Nitrile rubber" is a copolymer of butadiene and acrylonitrile containing between 50 to 75 per cent butadiene and 25 to 50 per cent acrylonitrile. It is produced by an emulsion polymerization process closely resembling that employed in GR-S manufacture.

Nitrile rubber compares favorably with natural rubber as far as tensile strength, elongation, and abrasion resistance are concerned when it is compounded with suitable reinforcing agents, sulfur, and accelerators and subsequently vulcanized. The presence of the polar cyano or nitrile group in the polymer molecule contributes to nitrile rubber vulcanizates a definite superiority to vulcanizates of natural rubber, GR-S, and even neoprene in resistance to oil, gasolines, solvents, and certain chemical reagents.

Due to this property of oil resistance, the vulcanized nitrile rubber retains its strength in the presence of such oils and chemicals under conditions where natural rubber and the synthetic all-hydrocarbon rubbers

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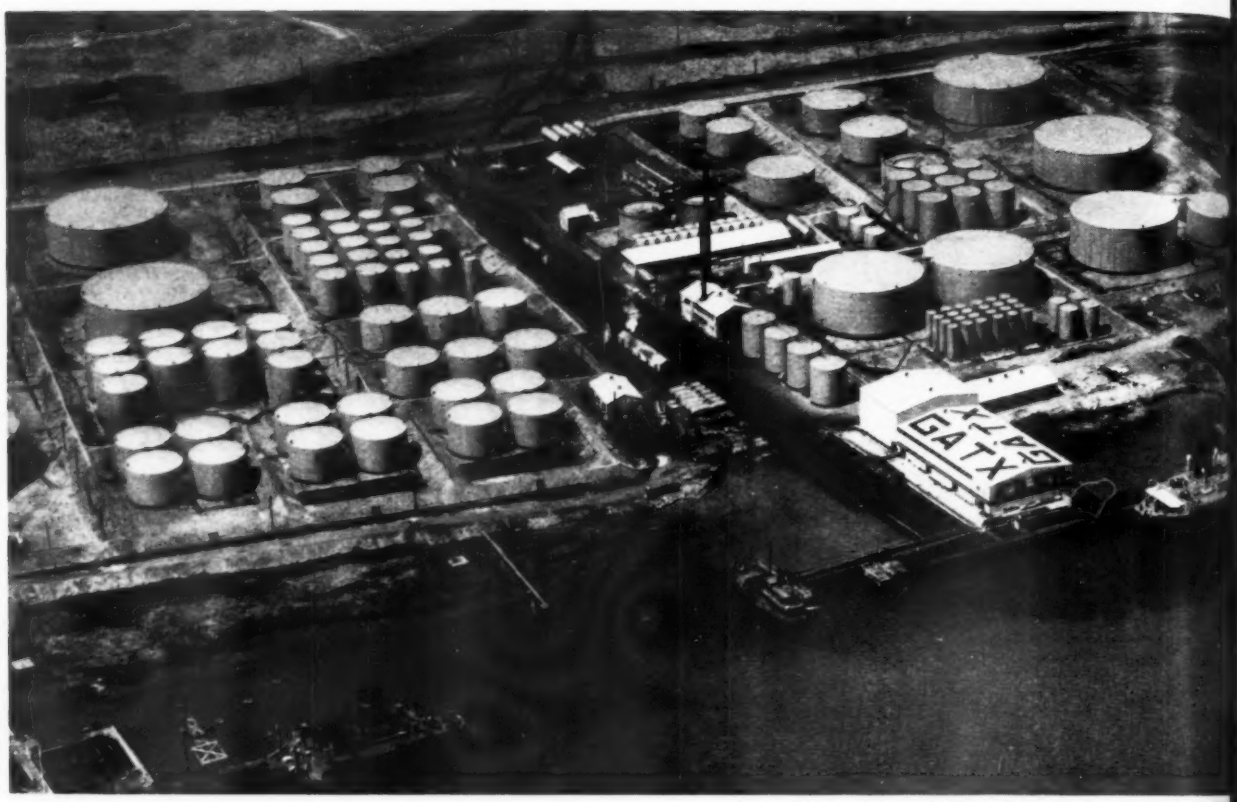

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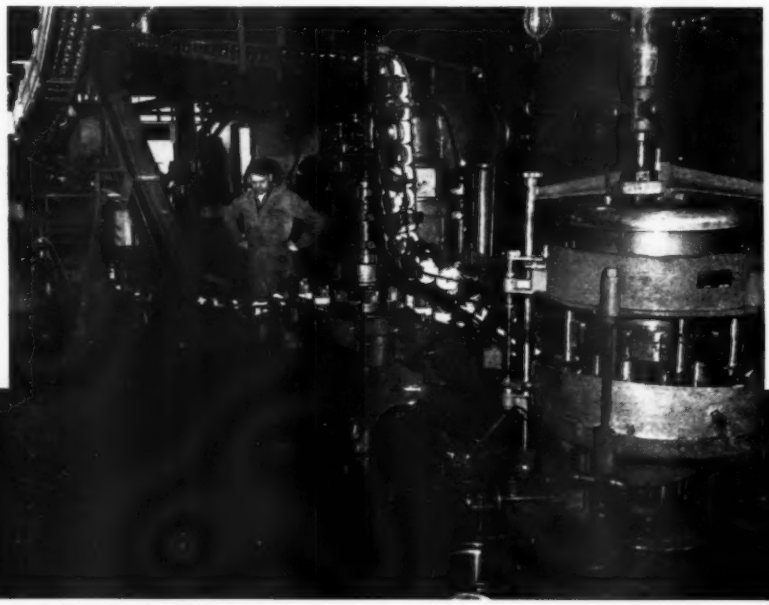

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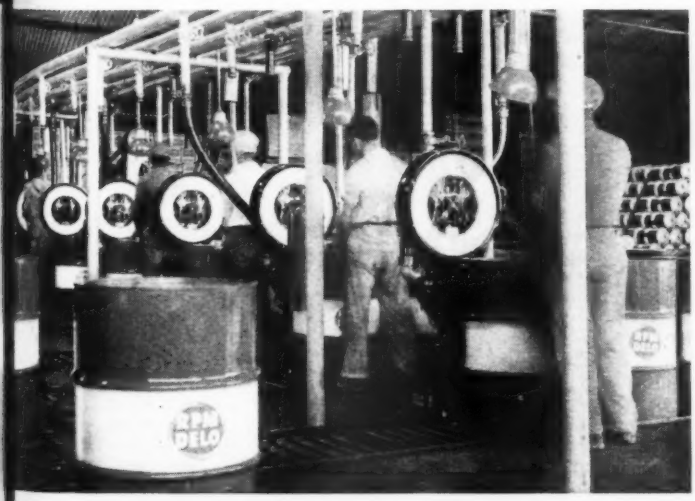

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would deteriorate in a very short period of time. It is, therefore, a unique type of specialty synthetic rubber and finds application, to the extent of 18 million pounds a year, in the manufacture of rubber parts which come in contact with petroleum products and certain solvents. Articles such as carburetor diaphragms, aircraft hose, gaskets, self-sealing fuel tanks, printing rolls, hose for transferring petroleum products, and shoe soles are presently being made from the nitrile rubbers.

Many years ago, isobutylene was polymerized in the presence of boron trifluoride as a catalyst and at a temperature between —60° to —150° F. to form a solid polymer possessing a molecular weight between 30,000 and 200,000. This polymer, sometimes called polybutene, is a substantially saturated hydrocarbon, it does not react or vulcanize with sulfur and is chemically inert. For this reason it is not classified as a synthetic rubber, its strength is low, and it cannot be fabricated into such common rubber articles as tires and tubes. It is used, however, in adhesives, chewing gum, electrical insulation, paraffin wax blends for carton coatings, and as a viscosity-index improver for lubricating oils.

Chemists working on the polymerization of isobutylene felt, however, that if a small amount of unsaturation could be introduced into the polyisobutylene molecule, a synthetic rubber might result which could be vulcanized and which, after vulcanization, would be chemically inert and in this respect superior to natural rubber which, by comparison, is highly unsaturated. Unsaturation has been introduced into the isobutylene polymer molecule by copolymerizing isobutylene with a small amount of diolefin such as butadiene or isoprene using a polyvalent metal halide as the catalyst at a temperature around —150° F. This copolymer, which possesses a molecular weight between 40,000 and 80,000 and contains only 1-2 per cent of the unsaturation present in natural rubber, is now widely known as butyl rubber. Both of the raw materials, isobutylene and isoprene, used in the synthesis of this copolymer are prepared by the cracking of petroleum fractions.

Butyl rubber can be mixed and compounded in a manner very similar to natural rubber except that more vigorous vulcanizing agents are required and the vulcanization must be carried out at higher temperatures than those normally employed on the other synthetic rubbers. Due to its branched structure and low unsaturation, butyl rubber is far better than natural rubber for many applications. For example, the diffusion of air through butyl rubber is about one-tenth that through natural rubber. Also it has unusually good age and tear resistance. The low gas permeability, high tear resistance, and good age resistance even after long usage suggested the use of butyl rubber in inner tubes and the major portion of the annual butyl-rubber production (118 million pounds in 1948) is presently being employed in the manufacture of inner tubes for automobile tires.

Extensive road tests have indicated that tires equipped with butyl-rubber inner tubes require inflation at only very infrequent intervals and the car owner is, therefore, apt to maintain the air pressure much closer to the optimum than when his tires are equipped with natural rubber inner tubes. In addition, when a nail or other puncturing object is driven into a fully inflated tire containing a butyl-rubber tube, the tube clings so tightly around the nail that the tire can be driven hundreds of miles before it gradually becomes flat.

Raw Materials From Refinery Streams

There are numerous other chemical compounds which can be, or are presently being, isolated from refinery streams for sale as such to chemical manufacturing concerns.

The growth of the plastics and synthetic fiber industries has continually increased the demand for the aromatic hydrocarbons. The source of these hydrocarbons, namely the high temperature carbonization of coal, has not expanded at a proportionate rate and is insufficient to supply the demands of the chemical industries. Accordingly, petroleum has been used as a new and dependable source.

Petroleum ortho xylene may be used in competition with coal-tar naphthalene, which is frequently in short supply, as a phthalic anhydride raw material. Ortho xylene is produced, along with other aromatics, particularly toluene, in the "Hydroforming" process for converting heavy naphtha fractions into high-octane-number gasolines. Along with toluene, a fraction containing the mixed ortho, meta, and para xylenes and ethyl benzene can be separated by extraction which can be further fractionated or selectively crystallized to separate the ortho and para isomers. The ortho xylene can subsequently be oxidized to phthalic anhydride which is used extensively in the preparation of ester plasticizers and alkyd resins.

The best available estimates indicate a production of not over 30 million pounds per year of ortho xylene from petroleum and, at most, this would provide not more than about 15 per cent of our phthalic anhydride needs which amount to 150 million pounds per year. The first ortho xylene plant is producing about 8 million pounds per year. Para xylene, on the other hand, is oxidized to terephthalic acid which, together with ethylene glycol, forms the basis for the new synthetic fiber Terylene (Fiber V).

Cyclohexane, which is presently obtained from coal-tar benzene by hydrogenation, occurs naturally to the extent of 1-4 per cent in the light-naphtha fraction of certain crudes. This can be separated from the fraction and is partly replacing benzene as a raw material for producing adipic acid, the basis of the synthetic fiber Nylon.

Other Petrochemical Products

In addition to the hydrocarbon raw materials discussed earlier, there are certain other chemical compounds, also classified as petrochemicals, which can be obtained directly from certain crude oils or crude-oil fractions or which may be produced by some reaction during the various refining processes. These include naphthenic acids, petroleum phenols (cresylic acids), mercaptans, hydrogen sulfide, and carbon dioxide.

Naphthenic acids, which are C_5 and higher fatty acids containing alkylated cyclopentane rings, are present in the gas-oil fraction of crude oils in amounts up to 1 per cent. They are recovered from the gas oil by extraction with a dilute (5 per cent) aqueous caustic soda solution followed by acidification of the aqueous extract to spring the organic acids. If desired, they can be purified by distillation and have found outlets to the extent of about 25 million pounds per year in the form of their cobalt or copper salts as paint dryers and fungicides respectively.

Cresylic acids or petroleum phenols, on the other hand, are obtained from cracked distillates such as heavy catalytic naphtha and cracked heating oil. They usually exist in these distillates in amounts up to about 0.2 per cent and are removed from the oils by extraction with a 10-40 per cent sodium hydroxide solution. The extract is subsequently steamed, carbonated with carbon dioxide to spring the alkyl phenols from the naphthenic acid soaps (which remain in solution), and the product subsequently distilled.

Although the composition of the petroleum phenols varies with different oil feeds, they are usually composed of mixed cresols and xylenols and consequently have found application in the manufacture of bakelite-type phenol-aldehyde resins, tricresyl phosphate plasticizers, wood preservatives, flotation agents, and disinfectants.

Most of the above discussion has been directed toward the production of organic chemicals and chemical raw materials from petroleum. It is possible, on the other hand, to syn-

thesize petroleum and particularly gasoline and diesel fuel from certain chemicals, specifically carbon monoxide and hydrogen. In this "hydrocarbon synthesis," "Fischer-Tropsch" or "Hydrocol process" as it is variously called, the carbon monoxide-hydrogen mixture, produced from natural gas is, by the most recent technique, passed over a fluidized bed of catalyst at about 665° F. and 250-500 psi.

The products of the reaction are separated into a gas fraction, hydrocarbon oil fraction, and a water layer. The hydrocarbon oil fraction is principally straight-chain paraffins and olefins with the latter predominating, while the water layer contains by-product oxygenated chemicals principally the lower-molecular-weight aliphatic alcohols, aldehydes, ketones, and acids.

A plant was recently completed and placed in operation at Brownsville, Tex., which is capable of producing 5,000 bbl. per day of gasoline, 2,000 bbl. per day of diesel fuel, and roughly 150 million pounds per year of oxygenated chemicals from 64,000,000 cu. ft. per day of natural gas.

Other Petrochemical Materials

There is another class of petrochemicals of direct interest to the oil business itself. It includes such materials as pour depressants, antioxidants, detergent additives, protective coatings, agricultural chemicals and a host of other compounds or products which can be or are being synthesized from petroleum. The availability of these products, as well as those discussed earlier, clearly indicates the broad scope and expanding nature of chemical production which is based on raw materials heretofore considered principally as fuels and lubricants. Research work will undoubtedly result in the appearance of many new organic chemicals and in a further expansion.

Chemicals From Natural Gas and Petroleum

(Continued from page 72)

oils from petroleum are used in leather dressing, metal cutting, wire drawing, and ore flotation.

Nitrogen Compounds

The petroleum industry is now an important source of nitrogenous fertilizer. Ammonia is synthesized from hydrogen obtainable from the high temperature cracking of natural or refinery gas and nitrogen from liquid air fractionation. This ammonia is injected into irrigation waters. Ammonium nitrate is made by the oxidation of ammonia by conventional methods and reaction of the nitric acid with more ammonia. The petroleum industry is thus supplying around 15 per cent of United States nitrogenous fertilizer requirements. The annual production of ammonia from natural gas is now 620,000 tons.

The nitration of petroleum hydrocarbons provides intermediates for a host of useful products. The lower nitroparaffins and alkylamines through C_5 are being produced commercially. The compound 2,2-nitropropane is an excellent additive for improving the ignition properties of diesel fuels. The alkylamines have grown in importance for use as intermediates for rubber chemicals and fungicides. Nitrocyclohexane and cyclohexylamine are also available. These compounds have a variety of possible uses in textile processing, pharmaceuticals, insecticides, and corrosion inhibitors.

Among the highly important nitrogen derivatives during the war were the xylidines which were added to motor fuels to increase the antiknock rating. Addition of xylidine is capable of extending considerably the supply of aviation gasoline. It is believed that xylidines will also be useful in the manufacture of dyes and intermediates, as accelerators for rubber, wood preservatives, wetting agents, antioxidants for paint pigments, and frothing agents in ore dressing.

Ethanolamine, isopropanol amine, and related compounds such as triethanolamine are made from the reaction of corresponding oxides with ammonia. Some of their uses are in cosmetics and detergents, and as solvents.

Acetonitrile, propionitrile, n-butyronitrile, and acrylonitrile, now made from petroleum, are important chemical intermediates. Acrylonitrile is used as an intermediate for acrylate resins and in the manufacture of GR-A type rubber.

Ethyleneamines have a diversity of uses. Ethylenediamine, for example is utilized in the preparation of fungicides, insecticides, dyes, waxes, medicines, and in a process whereby asphalt may be laid on wet surfaces. Ethylenediamine tartrate crystals are replacing quartz in telephone cables. It makes possible the transmission of 500 conversations at the same time over a single cable 2 in. in diameter and is superior to quartz because of its greater uniformity and easier processing.

Benzonitrile is the first of a series of aryl alkyl nitriles to be made from petroleum. This compound is derived from toluene and ammonia as base materials. It will have numerous applications because of its high reactivity with a great number of chemicals for the synthesis of rubber, resins, plastics, dyestuffs, and pharmaceuticals.

Nylon can now be made from petroleum by a process using as starting material cyclohexane, which is first oxidized to adipic acid. It may be expected that this source will be used more and more extensively. A large plant is being constructed in the Texas Gulf area to manufacture nylon salt from petroleum. Nylon salt is the product of the reaction between adipic acid and hexamethylene diamine. The dehydration of the salt makes nylon.

An efficient potato fungicide is made from ethylenediamine. This product is known as dithane. An alkyl benzyl trimethyl ammonium chloride is a recently developed and highly efficient disinfectant.

A group of explosives made from petroleum hydrocarbons deserves a place in any review of petroleum chemicals. Nitroglycerin can now be manufactured from petroleum-derived glycerin and nitric acid. Similarly, T.N.T. can be made from toluene and nitric acid. The explosive called tetranitromethane is so powerful that it ranks above all other types of explosives. By reacting nitromethane with formaldehyde and nitric acid, a powerful explosive (nitroisobutylglycerintrinitrate) is produced.

The petroleum chemical industry is expanding both in the United States and in other countries. In the Houston area alone, eight petroleum companies had an investment of $128,000,000 in 1949, and 12 chemical companies had an investment of $262,000,000. In Great Britain, Shell Petroleum Co., Ltd., has three major chemical enterprises involving an outlay of several million pounds. There is also a 5,000,000-lb. cooperative enterprise involving Anglo-Iranian Oil Co., Ltd., and Distillers, Ltd., and known as British Petroleum Co., Ltd. Imperial Chemical Industry, Ltd., has a plant under construction at Wilton which is to cost £22,000,000.

Petrochemicals, Ltd., has a multimillion-pound plant in operation at Partington near Manchester where the Catarole process is used to produce olefins and aromatics for chemical manufacture. In Holland, Royal Dutch-Shell Co. has installed a plant near Rotterdam as part of its 170,000,000-guilder postwar construction program. In France, a new concern for manufacturing petroleum chemicals has been formed by the St. Gobain and Shell companies.

At the present time, there are over half a million organic compounds. All of these can be synthesized from petroleum and natural gas if necessary. There are sufficient supplies of these raw materials which are more than adequate for manufacturing all the synthetic organic chemicals that the world may require.

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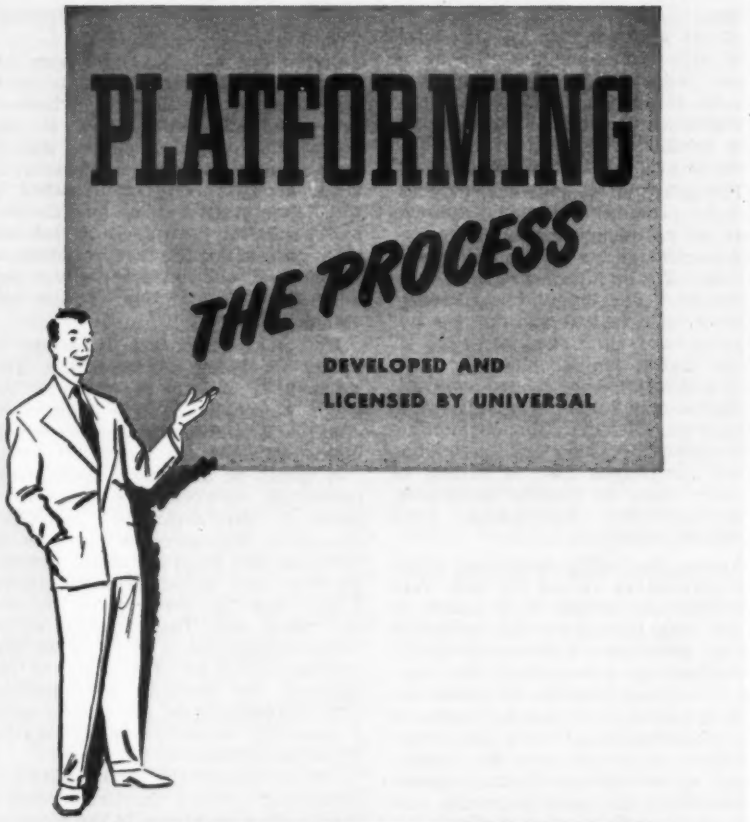

Mid-West Improvements to Include Platforming Unit

By L. A. Woodward, President
Mid-West Refineries, Inc.

The improvement of our product and the expansion of our operation generally to meet market demands, are the reasons behind Mid-West's recent decision to install a Platforming unit and to boost our crude capacity to 10,000 b/d.

L. A. Woodward

The history of Mid-West dates back to the discovery of oil in the Porter field, 14 miles northeast of Alma, Michigan. The company was formed in 1933 and in 1934 a topping unit to handle 1,500 b/d of crude was completed. Initial marketing included straight run gasoline, kerosene, distillate and fuel oil, all of which found a ready and profitable demand. The success of this first unit led to the installation of a second and larger (2,500 b/d) unit which was placed on stream the following year.

Pipelines

Pipelines were constructed from the Porter field, and shortly after, from the newer Crystal field near Alma to the southwest. The discovery of these and other fields led to the construction by other interests of a crude oil pipeline from central Michigan to Toledo, Ohio, since it appeared that the State of Michigan would become an exporter of crude oil. Subsequent years have not justified the earlier beliefs and Michigan has become increasingly dependent upon other areas for an adequate supply of crude oil. As a solution to this all-important problem of crude oil supply, Mid-West Refineries, Inc. has organized a new subsidiary, Michigan-Ohio Pipeline Corporation, which has in turn purchased this crude oil pipeline from a subsidiary of The Standard Oil Company with the intention of moving crude oil into, rather than out of, Michigan.

Michigan-Ohio Pipeline Corporation began operating the pipeline on September 1, 1950 and studies are now under way to determine the best means of coordinating the pipeline with the Alma refinery.

Install Dubbs Unit in 1939

By 1938, competition from other refiners who had begun operation in the same area, proved the necessity for a considerable expansion program and for the conversion of a greater portion of each barrel of crude into products of higher market value. The completion of a Dubbs Thermal Cracker and Reformer in 1939

(Advertisement)

provided for more efficient utilization of the crude we had been processing in our topping plants. At the same time we made other additions including a unit for the polymerization of non-condensed gases from the cracking unit. Thus, we gained important advantages over our competition.

We were able to convert into gasoline, a portion of the 40% heavy residuum from the topping operation, bringing the ultimate recovery of gasoline from each barrel of crude to upwards of 55% as compared with 26% possible with topping alone.

The quality of the gasoline, too, was vastly improved equaling in all respects the performance of any other motor fuel then on the market.

Acquire Second Refinery

Shortly before the war, the company acquired a second refinery located just east of Grand Rapids which had been constructed to take advantage of the crude supply made possible by the discovery of the Walker-Wyoming field. The equipment, including a gathering system and pipeline, was similar to that being operated at the original refinery at Alma.

During the war, the dwindling Michigan supply of crude was augmented by a supply from various Texas sources. With the end of the war, and the relaxing of government supervision of the industry, these sources were no longer open to us and we were faced with the problem of concentrating our crude supply at a single refinery. The Alma plant was selected for this purpose because of its connection with the major pipeline system in Michigan which was mentioned earlier.

At this time the company entered upon a program to broaden its markets, to increase its products and to reduce its dependence upon Michigan crude. A subsidiary company (Mid-West Petroleum Company) was formed for the purpose of owning crude producing properties and purchasing crudes from other sources for exchange purposes and for use at Alma. The refinery near Grand Rapids was sold, but the tankage, loading facilities, pipelines and buildings were retained for use as a terminal which has proved a valuable adjunct to the marketing operation, particularly in home and industrial fuel oils.

The Platforming Unit

Upon completion of our UOP Platforming unit, scheduled for early in 1951, we expect to enjoy an enviable position in our marketing area. Running Michigan and outstate crude oils, we will manufacture a Platformate having a leaded research octane number of approximately 96. Blending this effluent of the Platforming unit with our other products will enable us to deliver to our outlets, a premium grade motor fuel of really superior quality. This should give Mid-West an advantage market-wise for some time to come.

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Don't Lose Your Hole Because of Slush-Pump Failure

Here is a comprehensive program of preventive maintenance which will keep your pumps pumping

by W. J. Redman

MUCH has been said and written about how to select suitable pumps and prime movers for oil-well drilling. There is no mystery about the many factors which determine the mud volume and pressure required. The main consideration is that the equipment selected shall be neither too small nor too large for the contemplated drilling operations.

If the equipment is too small, parts will be overstressed and bearings will be overloaded, decreasing their life. It will be a constant burden to the owner, requiring frequent expenditures of money for parts and service to keep it in operation. If it is too large, it is heavier and more expensive to move and represents excessive capital investment, which handicaps the operator in trying to get work for the rig since higher rates must be charged. A well-balanced rig soon demonstrates its ability and attracts business to its owner.

Preventive Maintenance Program

Neglected or abused equipment is liable to fail at a critical time and sometimes cause loss of the hole. On the other hand, a program of periodical inspection and maintenance will keep equipment in shape to meet the emergencies which are encountered in drilling. Such a program is called "preventive maintenance."

A program of preventive maintenance in regard to pumps may be said to begin with the use of correct liner sizes for the pressures encountered. Changes in liner sizes must be kept to a minimum but there is a natural tendency to put off changing to a smaller size as long as possible without stalling the engine. It is obvious that such practice overloads the pump, the prime mover, and the drive for a considerable part of the operating time.

Pumps are designed to have a conservative life based on specific loading and have ample safety factor to carry considerable overload for short periods. Constant overload shortens the life of a pump by causing rapid wear and fatigue of working parts. Considering only the bearings used in a pump, a constant overload of only 10 per cent would reduce the expected life more than 25 per cent, and a constant overload of 25 per cent means a reduction of about 60 per cent in bearing-life expectancy.

The effect of loading on bearing life and pump speed is illustrated graphically in Fig. 1. If a minimum bearing life of 20,000 hours at 50-r.p.m. pump speed is taken as 100 per cent loading, Fig. 1 shows that 109 per cent loading, or less than 10 per cent overload, decreases the bearing life to 15,000 hours or a loss of 25 per cent. A loading of 89 per cent, or 11 per cent less than full rating, increases the bearing life to 30,000 hours or a gain of 50 per cent. The chart also shows that, keeping the same minimum bearing life, the amount of permissible loading is greater as pump speed decreases and is less as pump speed increases. Overloads at low pump speeds are not as harmful as those at higher speeds, but overloading a pump for long periods will require earlier and more frequent replacement of worn parts. Liner sizes should be changed as necessary to keep within the manufacturer's rating for the pump.

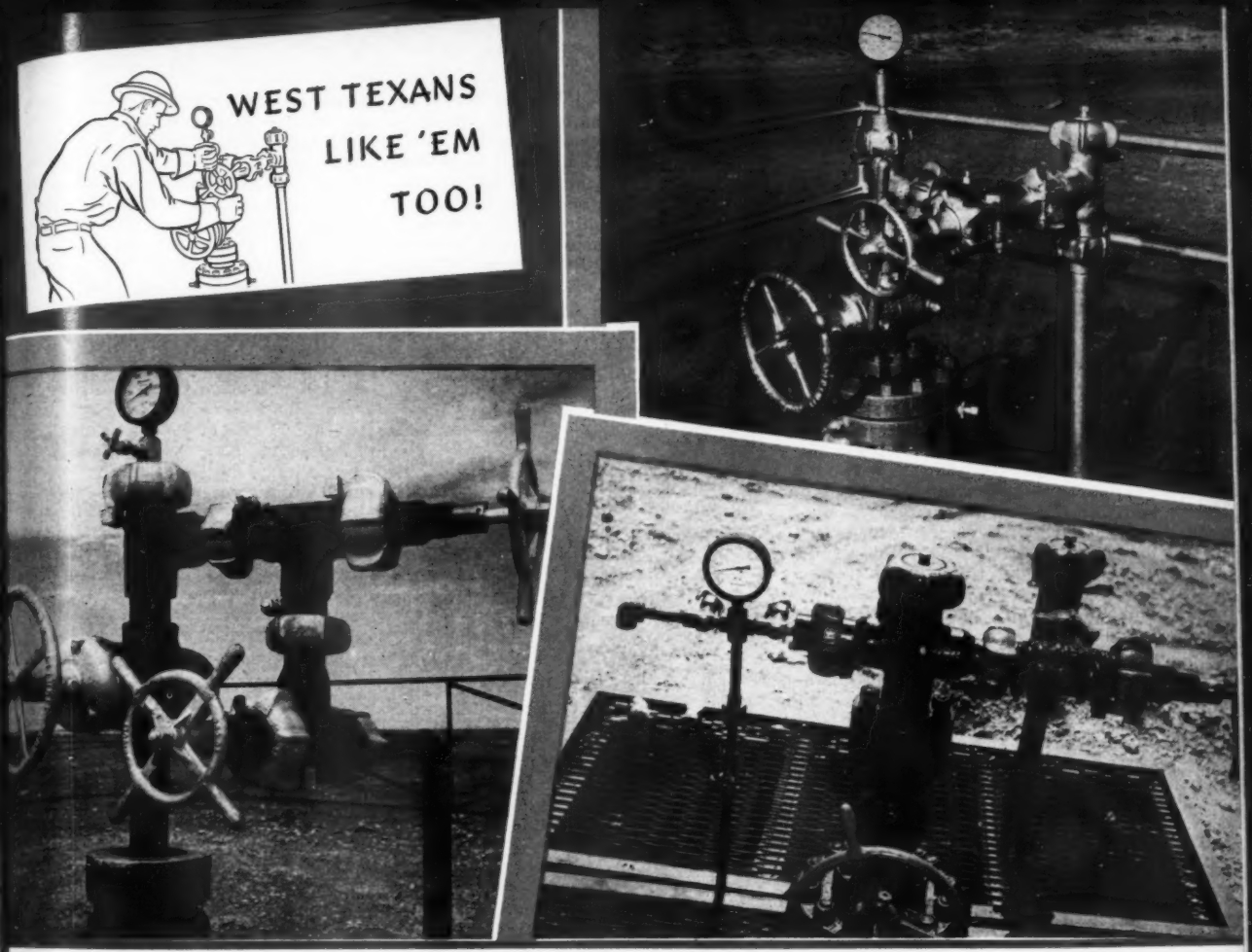
Pressure-relief valves set to suit

*Chief engineer, Wilson-Snyder Manufacturing Division of Oil Well Supply Co., Braddock, Pa. Paper presented at tenth annual meeting of American Association of Oilwell Drilling Contractors at Tulsa, October 1950.

CHECK LIST FOR MUD PUMPS

1. Keep liner sizes within the manufacturer's rating.
2. Set relief valve to suit liner size.
3. Outside diameter of liner should fit fluid chamber.
4. Keep liner spacer set screws tight.
5. Properly install all valves and seats, and see that flexible sealing disks are in good condition.
6. Piston rods should be smooth, not worn excessively, and centered in the stuffing boxes.
7. Properly install and adjust piston-rod packing.
8. Maintain diaphragm packing in good condition, and center extension rods in the packing space.
9. Properly adjust power-end crossheads, and have fluid piston bodies in good condition to keep rods centered in stuffing boxes.
10. Use good-quality clean oil in power end; change oil frequently to remove contamination.
11. Adjust bearings as recommended by pump manufacturer. Replace worn bearings which cannot be adjusted. Replace the complete bearing and not just part of it.
12. Check all bolting for tightness at regular intervals and in any event after first 2 to 4 weeks of operation.
13. Keep suction line short and direct with long radius bends. Keep suction lift as low as possible. Avoid air leaks and air pockets in suction line.
14. Use a suction strainer and clean it frequently. Do not let sand accumulate in suction line or passages of pump.
15. Use a strainer in discharge line to catch small objects which get past suction strainer or break off from valve disks or piston rubbers.
16. Use a full-size discharge line from pump to standpipe.
17. Protect idle pumps from damage by coating exposed finished surfaces with light grease. Wipe off before starting up.
18. Protect stacked pumps by weatherproofing exposed parts.
19. Drain fluid ends when pumps are to stand idle in freezing weather.
20. Protect spare parts by providing safe storage space.

W. J. REDMAN



Views from Scurry, County, Texas

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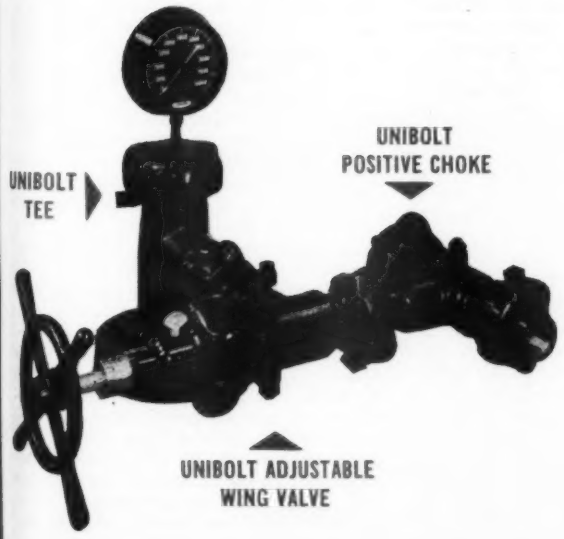

More and more operators are requesting their Christmas tree supplier to furnish UNIBOLT Flow Manifolds because they are lighter in weight, stronger, and more economical, and easier to maintain than ordinary flanged Christmas tree wings.

Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Flow Manifold is many pounds lighter, yet the UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

The units of the manifold — UNIBOLT Tee or Cross, Adjustable Wing Valve, and Positive Choke Body — are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual needs. They are furnished in regular forged steel or in high-chrome alloy for corrosive wells — 6,000, 10,000 and 15,000 lbs. test. The manifold is completely salvageable.

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the liner pressure are intended to protect the pump against damage. In general, a satisfactory setting is about 50 per cent above the recommended pressure for the liner size being used. When liners are changed to smaller size, the relief valve set pressure is increased by using a larger nail. When the larger size liners are again installed, it is important to make sure that the nail size also is changed to suit. Never use a piece of welding rod in the relief valve. They were never designed to operate on that basis, and, in fact, it has practically the same effect as having no relief valve at all. Relief valves cannot give the protection expected of them unless used in accordance with the manufacturer's recommendations as stated on the name plate.

Liners which have scored or pitted bores will tear up the fluid pistons in a very short time. Fluid pistons with damaged rubbers will allow mud to leak by and wash out the liners. New piston rubbers should be used with new liners.

Liners must have a generous chamfer at the head end to facilitate installing the fluid pistons without damaging the lips of the rubbers. Liners which are undersize on their outside diameter will be too loose in the fluid end, and the excessive clearance will allow the liner packing to extrude and fail. Many liner-packing difficulties can be traced to too much clearance between the liner and fluid end adjacent to the liner packing space.

Usual Cause of Failure

Liner packing usually fails because the bottom or inner ring extrudes into the clearance space between the liner and the fluid end. In addition to keeping the clearance space at a minimum, the bottom ring should be examined every time a liner is changed and replaced as often as needed. The outer packing ring probably will not need replacing as often as the inner one.

Keep the liner spacer set up tightly at all times. Loose liner spacers allow the liner to work and wallow out the fluid end. Working or end movement of the liner accelerates the extrusion of the liner packings.

Valves and seats will take considerable wear before being replaced, provided the rubbers are kept in good condition to seal against leakage. The metal part of the valve forms the support for the rubber seal. Wear or small washes in the area where the metal part contacts the seat usually cause no harm until they reach the point where the effectiveness of the rubber seal is endangered. Worn or damaged rubbers should be replaced as soon as discovered. Valve seats which are washed or damaged in the rubber sealing area should be replaced immediately. Failure to make these replacements may result in a washed-out valve deck.

When replacing valves, make sure that the tapered surfaces of the bore in the pump chamber and the outside of the seat are clean and dry. Rust or sand particles will hold the seat away from the bore and allow the mud to wash out the valve deck. Valve seats depend on the taper and friction between mating parts to hold them in place. Oil or grease on the surfaces reduces the friction and allows them to slide when subjected to heavy loads.

This same rule of clean, dry surfaces applies also when a piston is installed on a piston rod. Many cases of loose fluid pistons have been caused by oil or grease on the taper surfaces.

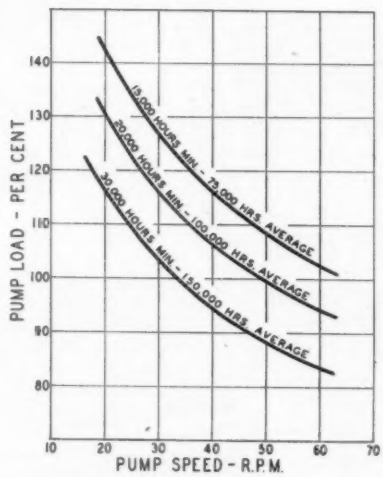

Fig. 1—Bearing life as related to pump load and pump speed.

Worn, scored, or pitted piston rods should be removed from the pump. It is impossible to pack off a scored or pitted rod. Packing cannot be expected to do a really satisfactory job if the rod is worn undersize in diamter more than about 1/32 in. Much packing trouble is traceable to too high gland pressure on the packing, which then binds and scores the rod. If the rod surface is smooth and polished, moderate gland pressure should be sufficient to keep the packing from leaking. Flushing the rod with oil instead of water seems to preserve its polished surface and reduce its rate of wear.

Keep Rods Centered

Excessive fluid rod and diaphragm packing wear and rod fatigue can be caused by not keeping the rods centered in the stuffing boxes. Crossheads should be adjusted and fluid piston bodies replaced as needed to keep the rods centered. When a rod is off center it bears against the packing at one point, deforming the packing and causing excessive wear. At the opposite side of the rod there will be a clearance between the packing and the rod, which allows air to enter the pump on the suction stroke and mud leakage to destroy the packing on the discharge stroke.

Misalignment of rods, due to worn crosshead shoes and guides and worn piston bodies, imposes an extra strain at critical points, resulting in fatigue failure. Rods must be kept tight in crossheads or extensions and lock nuts pulled up tight to prevent "working." Do not mar the surface of a rod by gripping it with a wrench in the packing rub area; use the knurled or undercut wrench grips which are provided for this purpose.

When crossheads are adjusted to center the rods in stuffing boxes, sufficient running clearance must be provided to avoid binding. A clearance of about 0.010 in. on large pumps and 0.006 in. on small pumps is usually permissible for normal direction of rotation. Practically all pumps can be run in the reverse direction of rotation with no alteration except possibly to reduce the amount of running clearance between the crossheads and guides.

Since the forces acting on crossheads during reverse rotation tend to lift them against the upper guides for most of the stroke length, excessive clearance will cause a knock at each end of the stroke when they drop back onto the lower guides. The suction and discharge piping of a circulating oil pump, either for power end lubrication or for fluid rod lubrication, will have to be reversed when a slush pump is run in reverse rotation.

Use Good, Clean Oil

The mud baffle and diaphragm packing are designed to keep mud out of the power end and should be kept in good condition. The mud baffle deflects fluid rod stuffing-box leakage and prevents it from reaching the diaphragm packing, but if the leak is really bad, the mud spray will fill the cradle section, find its way past the baffle, destroy the diaphragm packing, and enter the power end to contaminate the oil.

Dirty, contaminated lubricating oil is probably the cause of a major part of power end troubles. The mixture of oil and mud quickly loosens the working surface of bearings, gear teeth, and crosshead slides. Water in the oil will etch bearing surfaces and gear-tooth faces.

Cheapest and best insurance against excessive power end trouble is the use of good, clean oil of the proper type. The pump manufacturer's recommendations on lubricants should be followed. There are, however, only three main requirements the oil has to meet: (1), it must be clean; (2), it must be noncorrosive; and (3), it must have sufficient film strength to carry the gear-tooth load. The effectiveness of lubricating oil varies with the changes in the surrounding temperature. It is less viscous, or thinner, when heated, and more viscous, or heavier, when cold. Use a relatively heavy oil during the hot summer

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The Mogul Torcair Rig shown below is now the last word in 4000 to 5000-foot drilling.

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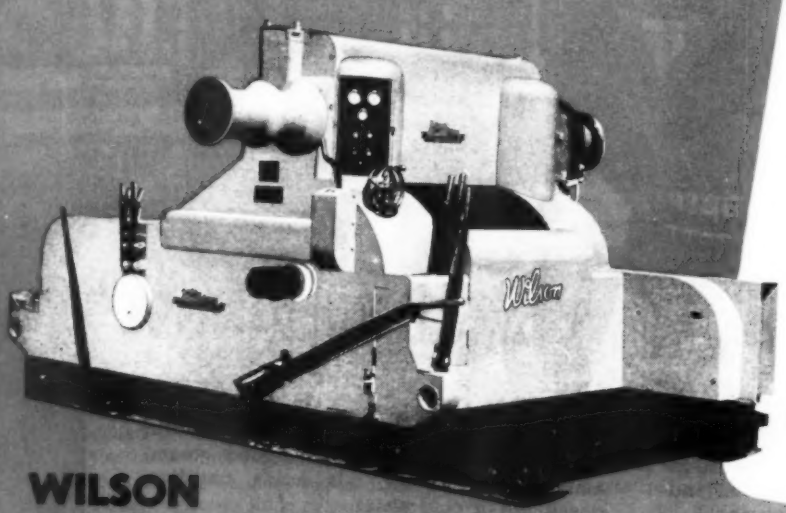

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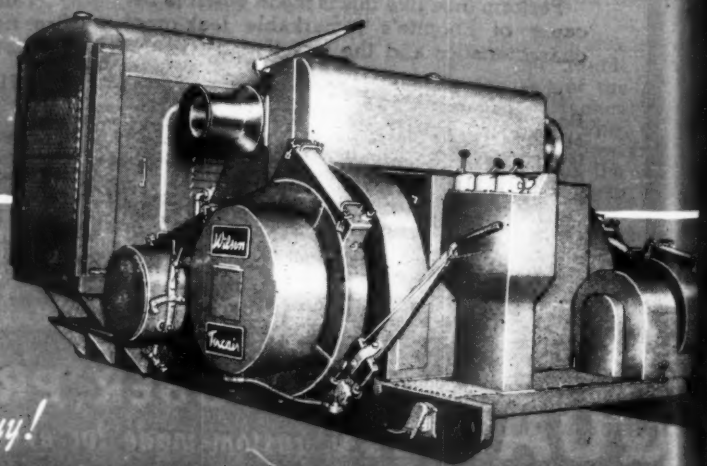

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months and a lighter oil during the colder season. For subzero temperatures, consult the pump manufacturer.

The importance of clean lubrication cannot be overemphasized. Contamination can be kept at a minimum by seeing to it that the fluid rod packing and diaphragm packing are kept in good condition and by changing oil in the power end at 3 or 4-month intervals or more often as needed. If a large amount of mud does enter the power end, drain the oil as quickly as possible, flush out the power end and parts thoroughly, wipe inner surfaces with rags where indicated, and fill with clean oil. Find the cause for the mud getting into the power end and remedy it before starting the pump.

Power end bearings should be kept adjusted as recommended by the pump manufacturer. In the presence of good clean oil, bearings will run for long periods before adjustment is needed. Bearings quickly develop looseness and require frequent adjustment when subject to the lapping action of an oil and mud mixture. Bearings cannot be expected to perform satisfactorily if they run in dirty oil.

Replace When Necessary

Where bearings are worn and cannot be adjusted, it is necessary to replace them. When replacements are necessary, replace the entire bearing and not just part of it. It is impossible to obtain good performance and life from a bearing if a new part is used with old parts. Replacements can be much more expensive than changing the oil to keep it clean.

There should be no looseness in the crank-pin bearings or the main bearings. The load on these bearings changes direction with each reversal of stroke, and any looseness will result in a severe shock when the clearance is taken up. The stresses due to impact or shock loading are incalculable, but it is a matter of record that many broken shafts, cranks, connecting rods, and bolts can be traced to loose bearings.

Under impact loading, the stress at some point in a shaft or crank may be above the endurance limit of the material, and a crack will develop which, in all probability, will cause the part to fail. Even though the peak stress may be in only a very small region of the part, the crack may form and, once formed, it will spread under the influence of only moderate loads and ultimately lead to failure of the part. This accounts for the fact that many failures seem to occur under normal loads, whereas the truth is that the crack formed at some previous time under a severe overload and has taken the intervening time to spread and cause failure. Periodical inspection can detect the presence of fatigue cracks before final rupture occurs.

All bolting throughout the pump should be kept tight. Here again, looseness will cause impact loading. Bolts should be checked for tightness after the first 2 to 4 weeks of operation, and thereafter at regular inspection periods. Bolting for valve covers and fluid cylinder heads, which have gaskets, should not be tightened in sequence around the circle but should be drawn up evenly by tightening a bolt on one side then on the opposite side until all bolts are tightened. This procedure distributes the load uniformly around the gasket to provide a more effective seal. Gaskets should be handled carefully to avoid damage when installing and removing covers. A damaged gasket will not seal properly and should be replaced.

The pump should be set level on solid ground. Uneven ground under the skids will warp the pump and cause serious strains. Skids should be adequate for the weight of the pump and long enough to prevent damage to the pump while loading and unloading it from trucks.

The suction line should be short and direct and not smaller than the size of the pump suction connection. Long-radius bends should be used to obtain best flow characteristics. Suction lift should be kept as low as possible. Where long suction lines and/or high suction lift is unavoidable, the use of a suction air chamber usually prevents fluid end knocks.

Air pockets and air leaks must be kept out of the suction line. Where air pockets are present, air may be drawn from them in sufficient volume to break the column of fluid in the suction line and cause the pump to lose its prime. Air leaks in the suction line can also cause the pump to lose suction, and in any event, they will lower the efficiency of the pump by reducing the amount of mud that is drawn in and discharged during each stroke.

Use of a suction strainer will keep debris out of the pump. Large objects entering the pump can lodge under the valves and may cause a washout. A strainer will not function properly unless cleaned frequently. Sand which settles out of the mud can also block the suction passages. Most fluid knocks are caused by the pump not filling completely during the suction stroke. Examine suction line and strainer for leaks or obstructions. Also check the valve cover and fluid cylinder head gaskets for air leaks. A strainer in the discharge line is a good safety precaution since it will catch any small pieces of rubber from valve disks or other small trash which may get into the pump. This is particularly important for jet-bit drilling where such objects may clog the small water courses.

When a pump is idle, especially in a humid atmosphere, rust and corrosion will attack exposed finished surfaces. Idle pumps, especially standby pumps, should be protected by coating exposed rods and other surfaces with a light grease. Wipe the rods clean to remove any windblown grit before starting up. When a rig is stacked, the pumps should be protected by weatherproofing all exposed finished surfaces, including rods, shaft extensions, and the grooves of the V-belt sheaves. Oil should be drained from the power end so as to remove along with it any grit or water which may have accumulated. Fill the pump with the required amount of fresh, clean oil when it is put in service again. Drain the fluid end at all times when the pump is likely to be standing idle in freezing weather. It is easier to prime a pump than to repair broken castings.

Spare parts are kept on hand so as to be able to make replacements quickly when necessary and so avoid keeping the pump shut down until a part can be obtained from the supply store. However, they are of little use and a waste of money if they are damaged through careless handling. A protected place should be provided in the tool shed where spare parts can be stored so that heavy tools and other parts cannot be dropped on them.

BOOKS

CRUDE OILS—CHEMICAL AND PHYSICAL PROPERTIES. Vol. 5, Part 1 of The Science of Petroleum. Edited by Benjamin T. Brooks and A. E. Dunstan. Published by Oxford University Press, 114 Fifth Avenue, New York. $11.

The contributions in this volume fall into two classes, those which deal with subjects and processes which are new in the industry since 1937, and those which supplement and bring up to date subjects which were thoroughly covered in the earlier volumes. The technical and scientific literature concerned with petroleum is scattered through a large number of excellent technical journals. Their number is beyond the capacity of any except the large and relatively complete libraries. It is the purpose of the publishers to bring together this record for the past 12 years by means of contributions by authors of high standing who are able to review and evaluate this mass of literature. The current volume treats the crude oils of the United States, Venezuela, Saudi Arabia, Bahrein Island, and the Middle East, and a second section, much longer, treats the chemical and physical properties of petroleum hydrocarbons.

BLACK BONANZA. By Frank J. Taylor and Earl M. Welty. Published by McGraw-Hill Book Co., 330 West Forty-Second Street, New York. 280 pp. $4.

This book describes how an oil hunt grew into Union Oil Co. of California. The authors explain how Union Oil grew big in a way different from other big oil companies. By fighting the battles of small independent producers and distributors, it expanded from a little wildcatting operation until its oil hunters probed the earth from Alaska to Paraguay—and even the shelf under the Gulf of Mexico. The company built the first tanker on the Pacific Coast; converted the first western locomotive to oil; laid the first pipe line across the Isthmus of Panama; punched the first deep wells and brought the world's largest gusher into the West. This exciting saga of how men of courage and vision built a flourishing industry reveals once more the energetic spirt of initiative which has motivated American enterprise from the beginning of her history. The book is illustrated with 180 photographs, spanning the lifetime of the oil business.

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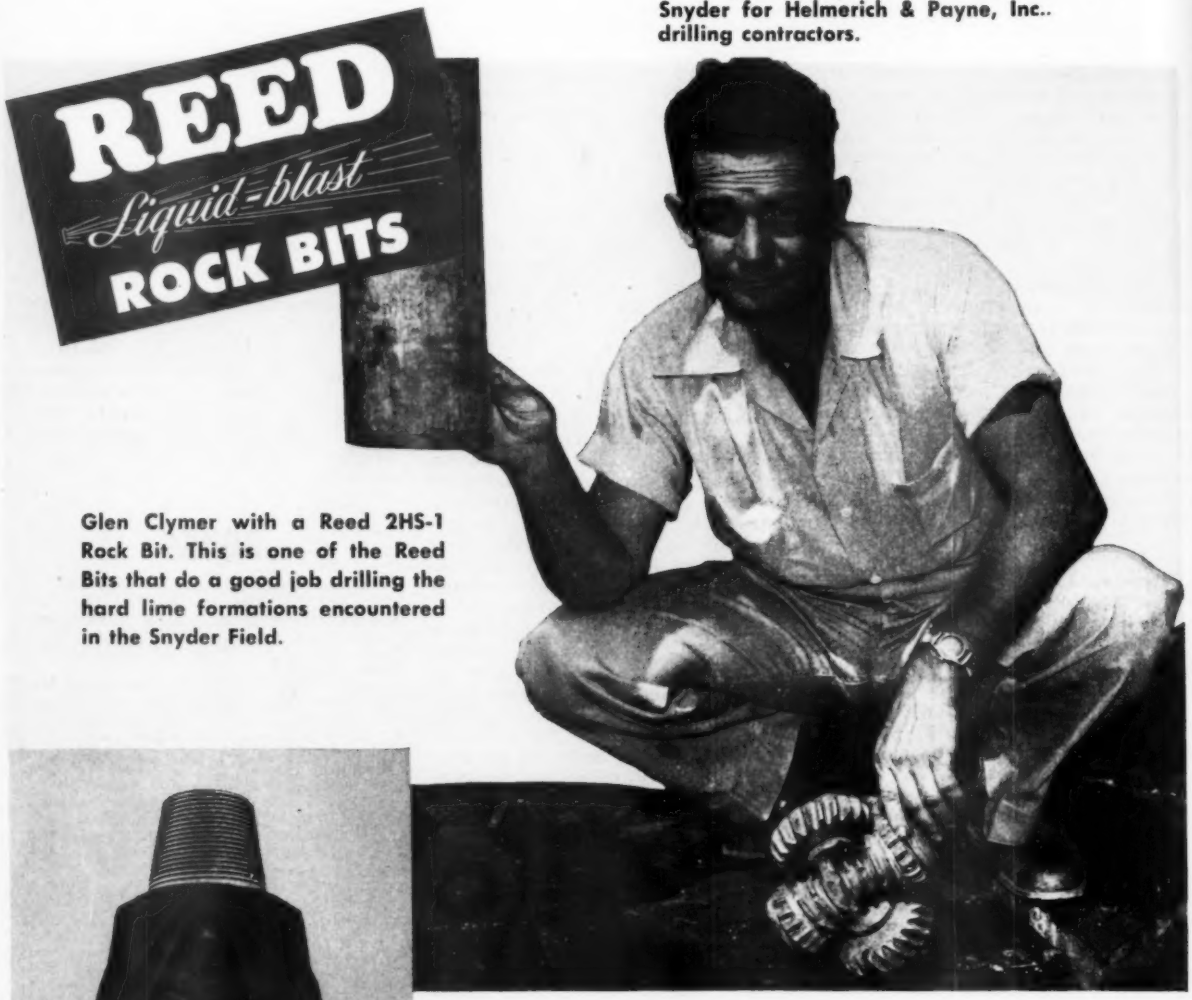
. . . says Glen Clymer, Tool Pusher at Snyder for Helmerich & Payne, Inc., drilling contractors.



Glen Clymer with a Reed 2HS-1 Rock Bit. This is one of the Reed Bits that do a good job drilling the hard lime formations encountered in the Snyder Field.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Drilling Changeovers

Recently we were discussing changeovers for our rig, i.e., reducing the size of the liners in our pumps, and the stringing of 8 or 10 lines on the hoist. Could you give me formulas, if there are some, to tell me the engineering factors that govern these choices?—R.L.M.

Your request for a formula has been answered by Prof. E. E. Barberii of the production department of University of Tulsa.

Reduction of liner size. — Any reduction of liner size means reduction in the volumetric discharge of the pump and an increase in fluid pressure.

At 100 per cent efficiency, the volumetric discharge of a duplex, double-acting pump may be calculated from:

$$Q = 0.00864\ NL\ \pi\ R_1^2 + 0.00864\ NL\ \pi\ (R_1^2 - R_2^2)$$

where

Q = Volume in g.p.m.
N = s.p.m.
L = Pump stroke in in.
R_1 = Radius of liner in in.
R_2 = Radius of pump rod in in.
π = 3.1416.

A new pump would ordinarily have a hydraulic efficiency of 96 per cent, and would usually be repaired before the efficiency dropped to 75 per cent.

Other factors such as type of formations drilled, density of cuttings, shape of cuttings, rate of penetration, and size of hole influence the volume of mud needed for bringing cuttings to the surface and maintaining a clean hole.

Lines reeved in the hoisting system. — The greater the number of lines reeved between the traveling block and the crown block the larger the load that can be hoisted. However, the greater the number of lines reeved the slower the speed of pulling drill pipe out of the hole.

The per cent efficiency of the hoisting system may be calculated from the following equation:

$$E = \frac{1}{1.04^{(N-1)}} \qquad (1)$$

where

N = the number of lines in contact with the traveling and crown block.

The "fast-line" pull factor can be computed from:

$$F = \frac{1}{N \times E} \qquad (2)$$

where

F = The fast line pull factor
N = The number of lines as in (1)
E = Efficiency as in (1)

The fast line pull, in pounds, is:

$$F_p = \text{Weight lifted} \times F$$

The weight is the weight of the drill pipe and collars when either in air or submerged in a mud of a given density. The buoyancy effect is not usually considered.

From the above it can be seen that the two considerations are not directly related. A sufficient rate of circulation of mud must be maintained in order to keep a clean hole regardless of the rapidity with which the drill string is pulled. Likewise, the speed with which the pipe can be lifted is not directly related to the rate of mud circulation required to keep a clean hole.

Instructions on Boiling-Out Of a Boiler

Please give me or direct me to instructions about cleaning out a boiler.—S. E. P.

The following instructions are mainly those of Combustion Engineering-Superheater, Inc., in the first edition of "Combustion Engineering."

A new boiler, or one that has undergone extensive repairs, will usually contain considerable grease or oil, and this must be removed by boiling out. For this process, a chemical charge is used in the proportion of 1 lb. of caustic soda and 1 lb. of soda ash per 1,000 lb. of cold water that is required to fill the boiler (and water walls, if installed). This charge is dissolved in water and introduced into the boiler, which is then filled with water to the normal starting level. A light fire, sufficient to raise pressure, is maintained for a period of 24 to 48 hours.

Trisodium phosphate is recommended as a substitute for soda ash. It is used in the same proportion: 1 lb. per 1,000 lb. of water.

The chemical charge can be increased if the boiler contains excessive quantities of oil. In some references, there will be found charges as high as 7.5 lb. caustic soda and 7.5 lb. soda ash per 1,000 lb. of water to fill the boiler.

When boiling out, it is most important to keep the boiler water hot and circulating. Successful cleaning cannot be accomplished otherwise, regardless of the cleaning chemical or the strength of solution used.

Start with a very low fire, and raise the boiler pressure to about 50 psi. in 4 to 6 hours. Keep the superheater outlet vents or drains open. Also, in the stream lines beyond the superheater outlet, open any drains that can be used to take additional steam from the superheater, so as to increase the circulation of the boiler water. All steam taken from the boiler should pass through the superheater elements. Drains in the saturated steam header, and boiler vents, should be closed.

When the pressure reaches 50 psi., check all boiler circuits to see that they are hot. Water-wall header cover panels can be left open so that downcomer and riser tubes are accessible. Now, continue raising the pressure slowly until all the circuits are hot, and then maintain this pressure until satisfied that the boiler is clean. Usually, a period of 24 to 36 hours after the boiler is hot is sufficient to remove the oil and grease from a newly erected boiler.

Drain the boiler while it is still fairly warm, and then open and wash it down with a hose, using clean water at fairly high pressure.

Inspect the boiler carefully, to make sure that no traces of oil remain. At this time a careful inspection should also be made to see that all foreign material, dirt, scales, welding spatter, and metal chips have been removed from the drums and headers. This material, if left in the boiler, usually fouls the safety valves and the blowoff valves, or it may pass into the turbines or engines. Practically all safety-valve troubles during preliminary operation of a new boiler are the result of damaged seats caused by foreign material from the boiler.

In riveted boilers, many engineers feel the use of caustic soda may promote embrittlement by filling seams with caustic. Some of the manufacturers of chemicals for water treatment have developed special boiling-out compounds designed to avoid this possibility. For example, one such compound is a combination of organic embrittling inhibitor, special oil emulsifier, and sodium sulfate.

The oil emulsifying agent is claimed to be five times as effective in oil emulsification as caustic soda. Any seams are filled with the organic inhibitor, it is stated, and no caustic soda can possibly get into them during the boiling out. The organic material is designed to be especially effective in penetrating fine cavities between joints or around rivet holes, while the sodium sulfate fills up large openings.

Dosage of this compound should be 25 lb. per 1,000 gal. of water placed in the boiler. Cooking, for cleaning only, in welded-drum boilers, should be done preferably at 50 to 100 psi. and should be repeated when the boiler is especially dirty with oil. For embrittlement protection in riveted-type boilers, follow this cleaning procedure with another cooking at operating pressure.

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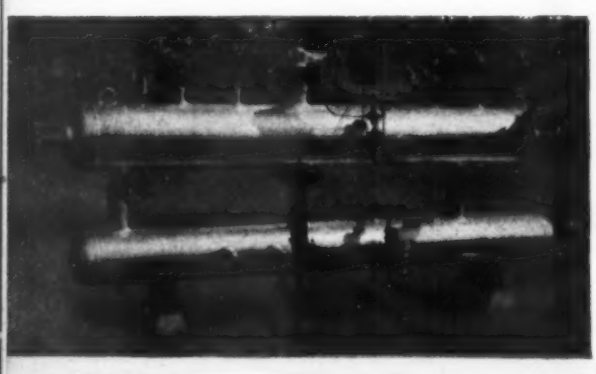

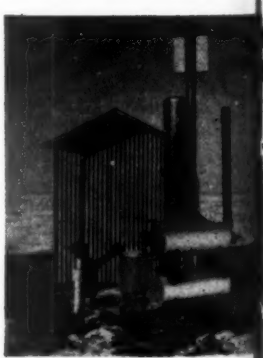

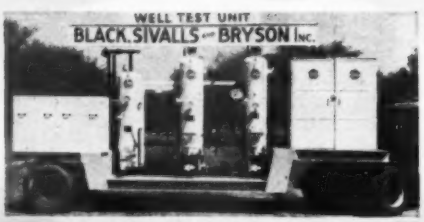

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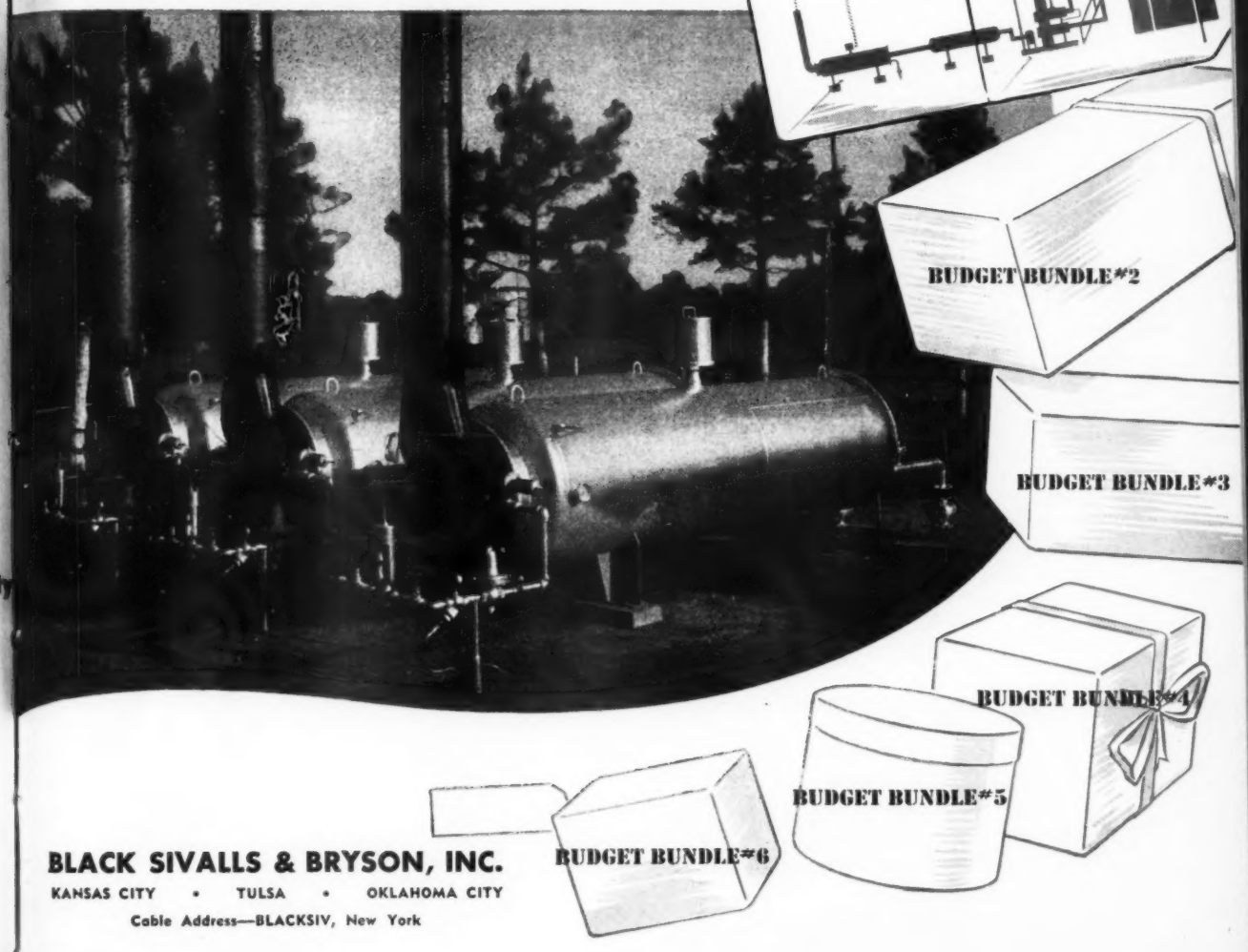

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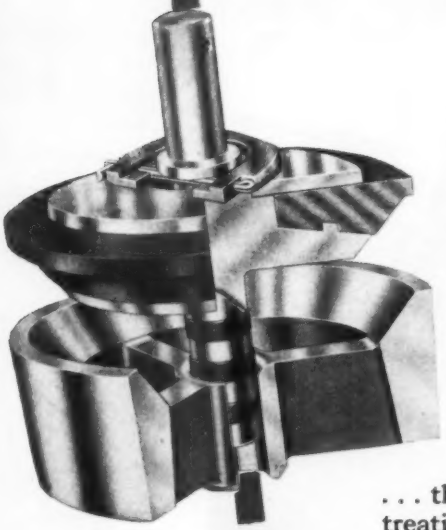

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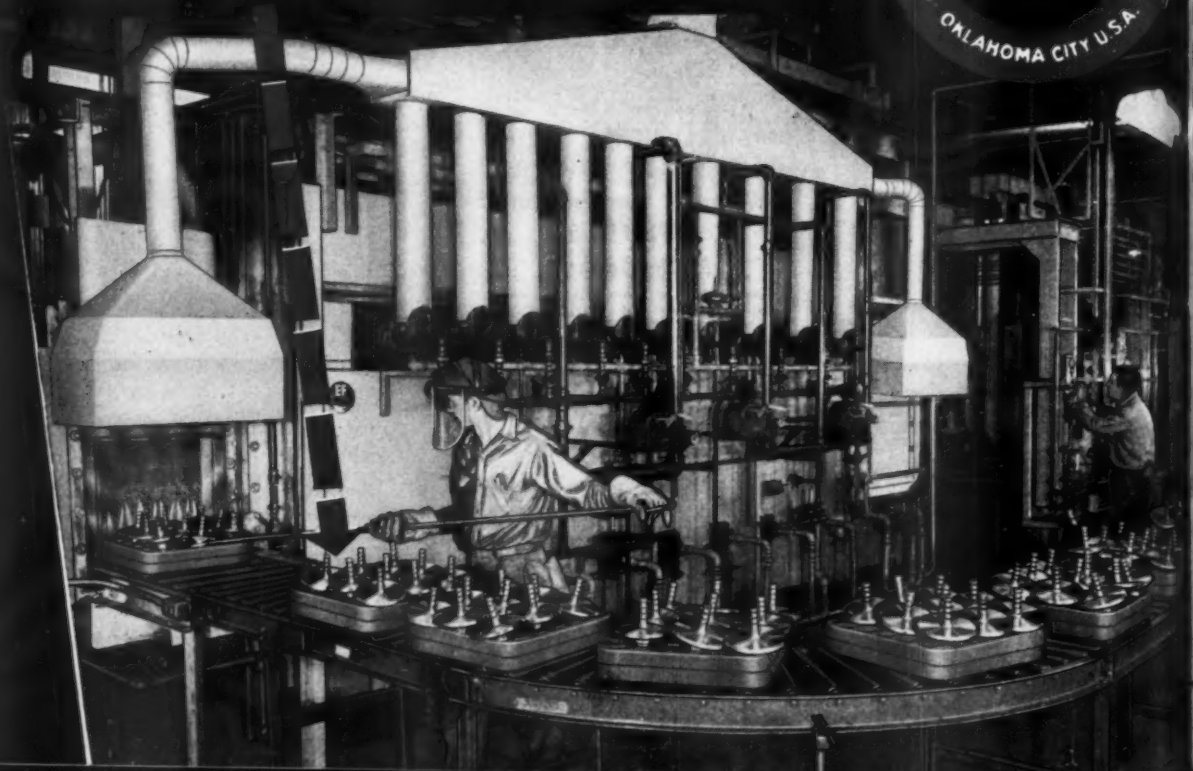

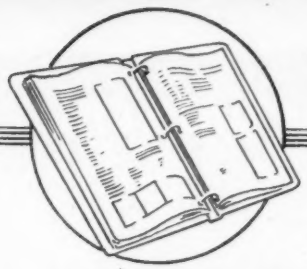

THE REFINER'S notebook

Graphic Instrumentation*—2

IN evaluating the graphic control system for three lube-oil refining units at the Standard Oil Co. (Ohio) Lima refinery, additional advantages considered were: (1) easier operator training, (2) savings in control-room space, and (3) over-all cost reduction. Against this were weighed the disadvantages of a less-flexible board arrangement and the limitation in the type of instruments available. Investigation of these factors disclosed a number of interesting points which will bear consideration by all potential users.

Arrangement.—In speaking of a graphic panel, we are thinking of a board with all essential process variables controlled from instruments located in a simplified flow diagram painted or fastened on the panel. We prefer either a full-length flat panel along the lines of that shown in Fig. 1, or a modified console type similar to the one in Fig. 2. The former shows the board for our vacuum distillation unit which separates crude into lube-oil feeds; the latter is a combined control panel for our solvent refining and dewaxing unit which processes finished blending stocks.

Training aid.—The panel served its purpose admirably during start-up operations. Explanations were clearer, difficult situations easier to handle, and operating technique developed more quickly. The newer men found themselves able to associate instrument functions, operating practice, and equipment more clearly. The veterans, too, found the pictorial diagram of great value in sizing up situations.

The vacuum unit graphic panel (Fig. 1) is located in the same room with conventional instrumentation for a propane deasphalting unit. Although the panels take up approximately the same space, the vacuum unit is much larger and has many more instruments. Both units are operated together by the same crew of men. After 3 months of experience they had suggestions for improving the method of identifying operating variables, grouping records more advantageously, and actuating alarms which we incorporated in a later unit. However, their preference for the graphic over the conventional arrangement was almost unanimous. Most of them felt that it had helped them to become familiar with the unit more easily and quickly. As for future panels, there was no question in their minds that they should be designed along graphic lines.

Saving space.—Economies in control-room space are important for two basic reasons. First, a smaller board groups the instrumentation within an operator's field of vision so that he can concentrate his attention. This increases his ability to watch the entire process and make the required adjustments. Second, a decrease in panel dimensions reduces control room size and lowers the instrumentation cost.

The pictorial diagram is most useful in coordinating thoughts and actions when a unit is in an "upset" condition. This is true in any type of operation but especially in a continuous process. Here the problem of handling the high throughputs with small surge capacities between stages can result in the spread of a difficult situation from one unit to another. For example, our Lima refinery lube plant is designed to process at least four different types of charge stocks. Ample tankage is provided to handle feed and protection requirements. However, the storage between the solvent refining and dewaxing units is capable of handling over 6 hours' operation. Imagine the effect a serious tie-up in the solvent refining plant can have on the dewaxing and treating operations which follow. A shutdown of all three operations is definitely possible. On the other hand, if an operator can recognize trouble symptoms soon enough and act promptly, he can prevent a serious situation. Obviously, the compact graphic arrangement improves an operator's understanding of a situation, speeds up his response, and helps minimize potential upsets.

*Portion of paper, "Graphic Instrumentation—A New Tool for Industry," by W. S. Bowers, Standard Oil Co. (Ohio), presented at 1950 meeting of Instrument Society of America, Buffalo.

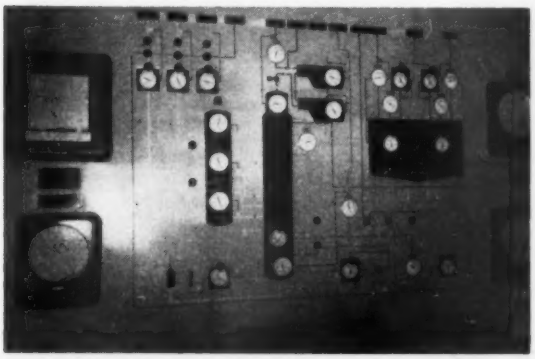

Fig. 1—Graphic panel (flat panel type), vacuum distillation unit of Standard Oil Co. (Ohio) Lima refinery.

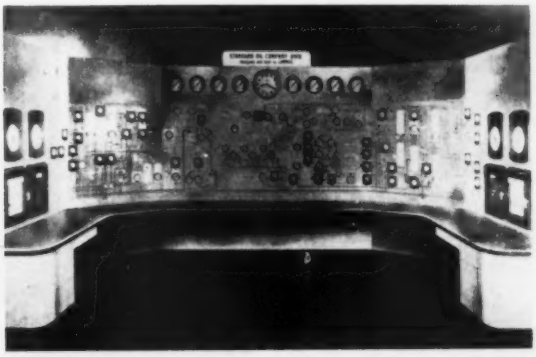

Fig. 2—Graphic panel (console type), combined solvent refining and dewaxing unit.

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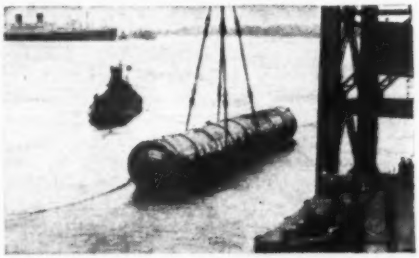

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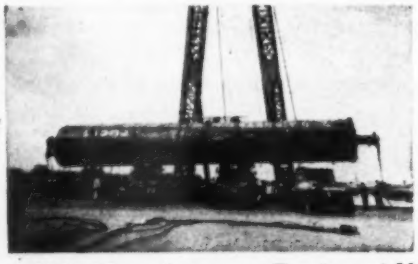

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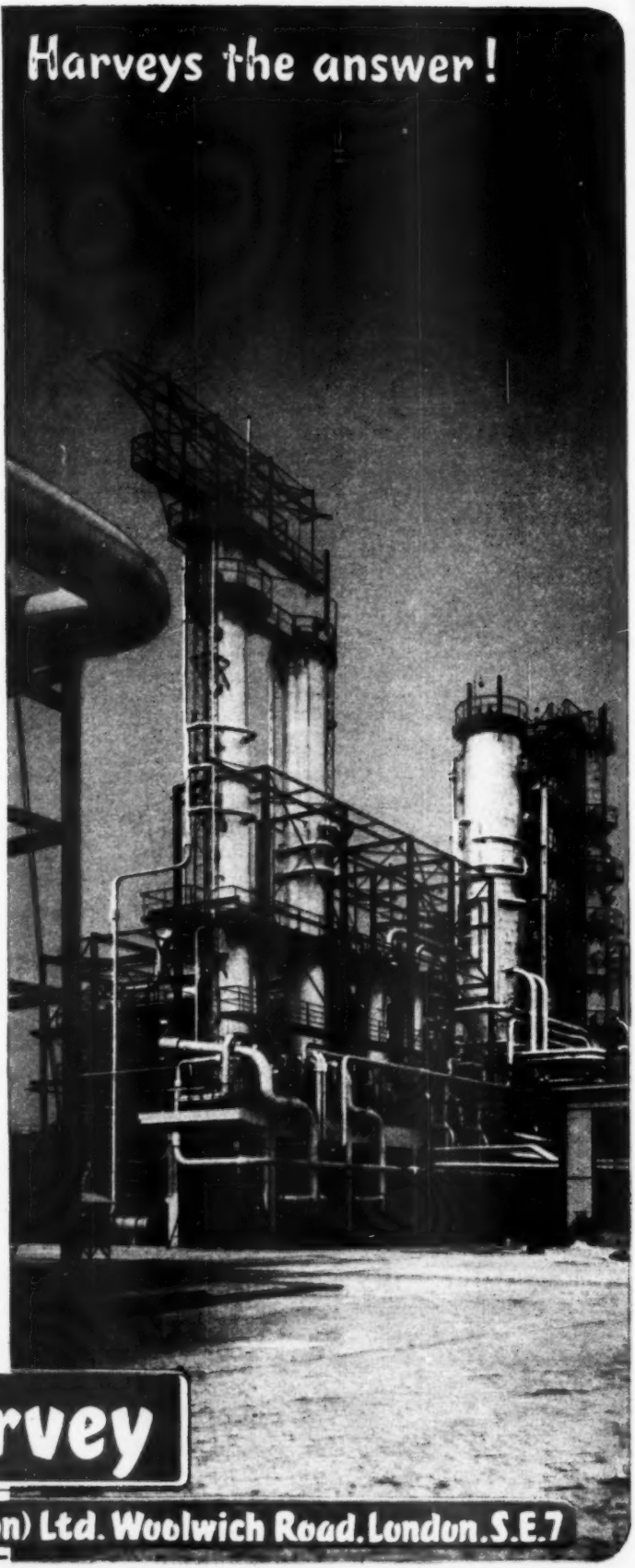

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Summary of Gas-Drive Predictions

MEANS of predicting reservoir behavior have been given for several different situations where gas drive is the producing mechanism. These are summarized with an outline indicating their use. In all cases three separate equations and a relationship between oil saturation and k_g/k_o must be known before calculations can be made.

CASE I: Solution-gas-drive reservoir, no gas cap, no water encroachment, no gas reinjection:

$$1/2\,(R_2 + R_1)\,(\Delta N_2/N - \Delta N_1/N) = (u_2 - u_o)/v_2 - (u_1 - u_o)/v_1 - (\Delta N_2/N)\,u_2/v_2 + (\Delta N_1/N)\,u_1/v_1 + (\Delta N_2/N - \Delta N_1/N)\,r_o \quad (1)$$

$$R_2 = (k_g/k_o)_2\,(\mu_o/\mu_g)_2\,\beta_2/v_2 + r_2 \quad (2)$$

$$S_{o_2} = (1 - S_w)\,(1 - \Delta N_2/N)\,\beta_2/\beta_o \quad (3)$$

CASE II: Solution-gas drive with gas cap and gas reinjection, no water encroachment, gas-cap gas and gas reinjected diffusing down through oil zone completely:

$$1/2\,(R_2 + R_1)\,(\Delta N_2/N - \Delta N_1/N) = (1/N)\ \text{gas reinjected during interval} + (u_2 - u_o)/v_2 - (u_1 - u_o)/v_1 + mu_o\,(1/v_1 - 1/v_2) + (\Delta N_2/N - \Delta N_1/N)\,r_o - (\Delta N_2/N)\,u_2/v_2 + (\Delta N_1/N)\,u_1/v_1 \quad (1)$$

Equation 2—Same as for Case I.

Equation 3—Same as for Case I.

CASE III: Solution-gas drive with gas cap, no gas reinjection, no water encroachment; gas cap expands without diffusing into the oil zone:

$$1/2\,(R_2 + R_1)\,(\Delta N_2/N - \Delta N_1/N) = (u_2 - u_o)/v_2 - (u_1 - u_o)/v_1 + mu_o\,(1/v_1 - 1/v_2) + (\Delta N_2/N - \Delta N_1/N)\,r_o - (\Delta N_2/N)\,u_2/v_2 + (\Delta N_1/N)\,u_1/v_1 \quad (1)$$

Equation 2—Same as for Case I.

$$S_{o_2} = (1 - \Delta N_2/N)\,(1 - S_w)\,(\beta_2/\beta_o)\,(1/[1 - m\,(v_2 - v_o)]/v_o) \quad (3)$$

CASE IV: Solution-gas drive with gas cap, gas reinjection, no water encroachment; gas cap and reinjected gas expand without diffusing into oil zone:

Equation 1—Same as for Case II.

Equation 2—Same as for Case I.

$$S_{o_2} = (1 - \Delta N_2/N)\,(1 - S_w)\,(\beta_2/\beta_o) \times (1/[1 - m\,(v_2 - v_o)]/v_o - [\text{S.C.F. gas reinj.}]\,[v_2/N\beta_o]) \quad (3)$$

In all these cases the process of solving the equations is the same. Proceed step by step as follows:

1. Conditions at Time 1 are known, including ΔN_1, R_1, and P_1. The latter gives u_1 and v_1. Original reservoir conditions are known, including the size of gas cap, m, if any, and the size of the oil reservoir, N, as well as the original reservoir pressure. The latter gives u_o and r_o. These quantities are all substituted in the first equation.

2. A value of R_2 is estimated and substituted in the first equation.

3. The first equation is then solved for ΔN_2, which will be an approximate value.

4. The value of ΔN_2 from Step 3 is substituted in the third equation along with other known quantities.

5. The third equation is evaluated for S_{o_2} which is used to evaluate a numerical reading of $(k_g/k_o)_2$ from a known relationship between saturation and relative permeability ratio.

6. The second equation is now used to calculate a value of R_2, using the value of $(k_g/k_o)_2$ from Step 5 and other known quantities.

7. Use the value of R_2 found in Step 6 to start a new series of calculations as in Steps 2 to 6, thus finding a new value of ΔN_2.

8. Repeat until the estimated value of R_2 used in Step 2 is equal to that found in Step 6.

The results of calculating these cases for a given reservoir fluid would yield comparative histories as shown in Fig. 1. The inference is that the pressure decline could be lengthened out until 100 per cent of the oil in place had been produced if the right amount of gas reinjection were used. This appears because no limiting saturation conditions have been set in the equations. One must appreciate beforehand that no one of these situations will produce all of the oil, and must modify the calculation to meet these limits. Should the residual oil values be worked into these equations (as can be done in the differential form) the depletion would automatically be complete below that limit.

Nomenclature: Same as for Engineering Fundamentals No. 421.

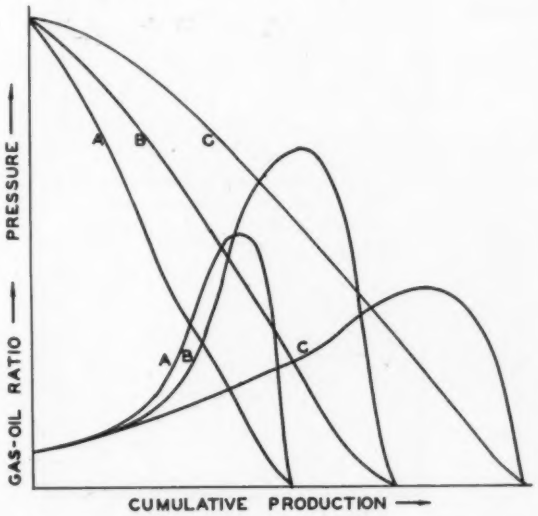

Fig. 1—Comparative production histories for gas-drive conditions. Gas reinjection would have the same effect as an increased gas cap.
A is solution-gas drive (Case I).
B is solution-gas drive with diffusing gas cap (Case II).
C is solution-gas drive with expanding gas cap (Case III).

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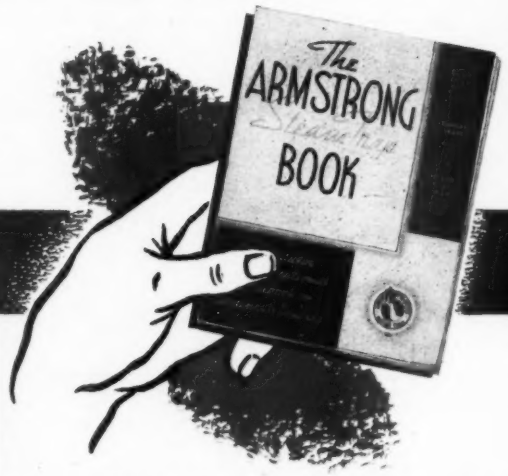

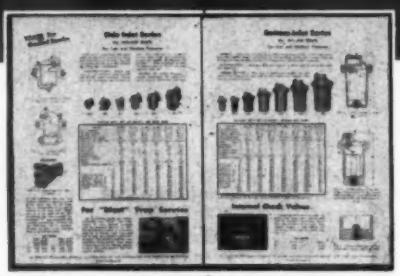

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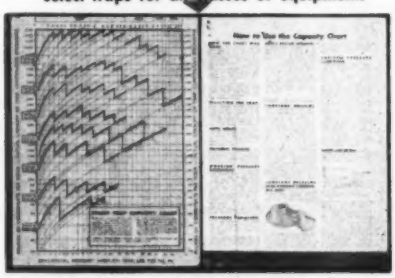

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PIPE LINES

Microwave System Planned

HOUSTON.—Surveys are advancing along the 1,300-mile pipe line of Trunkline Gas Co., to locate station sites for a new microwave-communication system, which will be the second longest used for industrial communications.

Four intermediate stations will be installed between the Texas and Illinois terminals of the natural-gas artery, with locations in eastern Texas, northern Louisiana, northern Mississippi, and the southern tip of Illinois. Upon completion of the survey and the purchase of necessary land, construction work will start at once on the microwave towers, equipment housing, and power lines.

The unattended repeater stations will establish the P.T.M. (pulse-time-modulation) communication system to serve the entire length of the line. The system will be initially equipped for operation of five voice channels, with facilities for V.H.F. (very high frequency) mobile-radio connection, dispatcher's operations, administrative functioning, and telemetering. It is designed for ready expansion to a 23-voice channel system to meet future service requirements.

Its flexibility and adaptability to short and long-hop operation are said to make the system especially suitable for cross-country distances encountered in the pipe-line industry.

P.T.M. not only permits the use of simpler repeater equipment, but also provides telephone circuits of low maintenance cost. The equipment will be manufactured and installed by Federal Telephone & Radio Corp., Clifton, N. J., associate of International Telephone & Telegraph Corp.

NEW BUILDING.—Service Pipe Line Co.'s new building is shown above, against a backdrop of other Tulsa skyscrapers. The structure, opened for public inspection last week (see this week's news section), is of unique design, and is the largest building ever constructed for use by a pipe-line company.

River Traffic Halted

NEW YORK.—Traffic in the Harlem River was halted while a 568-ft. span of 30-in. pipe line was laid under 35 ft. of water last week. Laying of the pipe was the last major link in the New York metropolitan area to connect the local distributing system with the main artery of Transcontinental Gas Pipeline Corp.

When connection is made about December 1, natural gas will be serviced in the Bronx, Queens, Brooklyn, and Nassau County. The local distributing agency is Consolidated Edison Co.

To protect against any possible interruption of natural-gas service to the metropolitan area, Transcontinental is asking the Federal Power Commission for authority to construct an 11.2-mile extension, which will act as a parallel to present installations. This would extend from a point near East Carteret, N. J., to the Bay Ridge section of Brooklyn, and would involve an extensive underwater operation. Diameter of the projected section would run from 20 to 26-in., and cost is estimated at $3,585,082.

Michigan Line Proposed

WASHINGTON.—Proposal to build a 55-mile pipe line to carry natural gas into new Michigan markets has been made by Southeastern Michigan Gas Co., Chicago, in an amended application filed with the Federal Power Commission. The appeal also asks that Panhandle Eastern Pipe Line Co., Kansas City, be directed to supply the natural gas for the proposed project.

Estimated cost of the facilities is $1,400,000, offering a delivery capacity of 20,000,000 cu. ft. of natural gas daily. The pipe line would reach new consumers in Port Huron, Marysville, St. Clair, and contiguous areas in St. Clair and Macomb counties.

The project involves Southeastern's plan to acquire existing distributing facilities from Detroit Edison Co., which now serves the area with manufactured gas.

Gas Taplines Proposed

WASHINGTON. — Communities in Mississippi have proposed an over-all pipe-line system to serve them with natural gas in volume approximating

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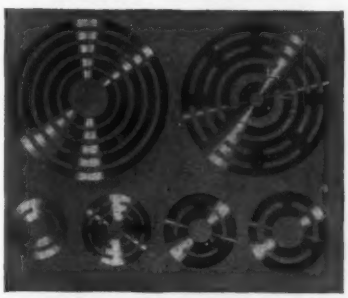

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8,640,000 cu. ft. daily. Application was made by Ripley, Booneville, and Baldwyn, seeking an order that Tennessee Gas Transmission Co., Houston, connect its transmission system with proposed facilities for the delivery and sale of an adequate supply of natural gas.

The project would include a 16-mile line of 6-in. pipe extending from Tennessee's system to Ripley, with a connection at that point to serve Ripley and Blue Mountain. The line would then extend 22 miles toward Booneville and Baldwyn, with a 5-mile tapline to Baldwyn and Wheeler, and a 6-mile tapline to Booneville. The facilities would bring natural gas to an area now dependent on bottled gas.

Pipe-Line Sale Postponed

WASHINGTON.—Postponement has been asked in the proposed sale of 21 miles of pipe line and a compressor station which Northern Natural Gas Co., Omaha, is negotiating to buy from Independent Natural Gas Co., Pampa, Tex.

Both companies had joined in the application to the Federal Power Commission for sale authorization. Northern now advances the need of further time to negotiate the sales agreement before the commission acts on the plan.

Second Safety Award Won

TULSA.—Service Pipe Line Co., Tulsa, has again qualified for national safety distinction. The company's second award of honor for distinguished service to safety has been conferred by the National Safety Council.

J. L. Burke, president, received the award through the Oklahoma Safety Council.

To win the award a company must show a decrease in its disabling frequency rate for 3 straight years, and must have an accident rate well below the national average for its particular industry. Service Pipe Line's rate for 1949, the year covered by the award, was 4.38 disabling injuries per million man-hours worked as compared to the industry's national average of 11.02. In 1946 Service (then Stanolind Pipe Line Co.) won the award with an accident frequency of 4.01.

Work Started on Gas Line

CHATHAM, Ont.—Work has been started by Union Gas Co. on the first unit of a 63-mile natural-gas-transmission line to connect Windsor, Ont., with the Dawn storage field of Lambton County, Ontario. The line, 16-in. in diameter, will cost $8,500,000, and will have a capacity of 75,000,000 cu. ft. daily. Shaw Construction Co. holds contract.

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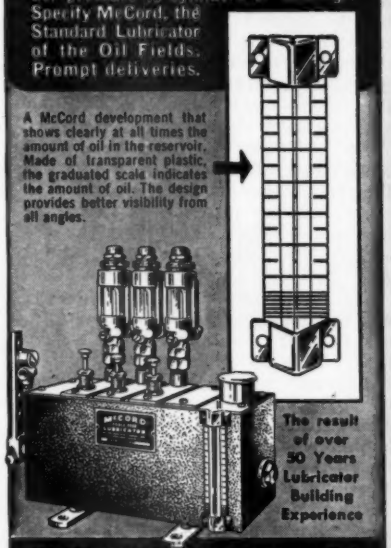

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Pipe-Line Construction

FOLLOWING is a tabulation of pipeline projects which are planned or under construction. Included are crude-oil, products, and natural-gas lines. The list was compiled from surveys made by The Oil and Gas Journal.

Crude-Oil Pipe Lines

Gulf Refining Co., Tulsa Pipe Line Division.—72 miles, 6-in., under way, El Dorado, Kans., to Webb City, Okla.; Pipeline Service Co., contractor. J. W. Welcher, Atlanta, Kans., spreadman.

Lakehead Pipe Line Co., Inc. (American subsidiary of Interprovincial Pipe Line Co., Canada).—321 miles, 18-in., contracted Neche, N. D., to Superior, Wis., to be completed October 1950; Anderson Bros., contractor.

Ohio Oil Co.—54 miles, 20-in., underway in Illinois; Betchel Corp., contractor; S. D. Betchel, Jr., superintendent.

Pan American Pipe Line Co.—80 miles, 10-in., under way, from southern part of Scurry County, Texas, to a connection with Humble pipe line near San Angelo, Tex.; Brown & Root, contractor.

Pelican Oil Co.—60 miles, 6-in., under way, Lake Charles to DeQuincy, La.

Phillips Pipe Line Co.—50 miles, 6-8-in., under way, Phillips tank farm, Sweeny, Tex., to Humble's Webster Station, Galveston County, Texas; O. R. Burden Construction Co., contractor; B. C. Barney Hall, spreadman.

Phillips Pipe Line Co.—25 miles, 8-in., considered, loops between Thrall and Kansas City, Kans.

Platte Pipe Line Co.—1,080 miles, 16-20-in., planned, Worland, Wyo., to Wood River refining area in Illinois.

Portland Pipe Line Co. (Montreal Pipe Line Co., Ltd.).—236 miles, 18-in., contracted, Portland, Me., to Montreal, Que., Canada.

Portland Pipe Line Co. (Montreal Pipe Line Co., Ltd.).—85 miles, 18-in., under way, Portland, Me., to Gorham, N. H.; Oklahoma Contracting Co., contractor of Section 1; H. A. Waylie, Westbrook, Me., superintendent.

Portland Pipe Line Co. (Montreal Pipe (Canada).—321 miles, 18-in., contracted, Gorham, N. H., to international boundary near N. Troy, Vt.; Associated Pipeline Contractors, Inc., contractor of Section 2. Lacy Walker, Barton, Vt., spreadman.

Portland Pipe Line Co. (Montreal Pipe Line Co.).—68 miles, 18-in., contracted, Canadian boundary to Montreal; Fred Mannix, contractor of Section 3.

Service Pipe Line Co.—25 miles, 8-in., under way, Beaver Creek and Riverton, Wyo.; Vaughn & Taylor Construction Co.

Shell Pipe Line Corp.—39 miles, 10-in., under way, McCamey to Kemper, Tex.; McVean & Roberts, contractor.

Texas-New Mexico Pipe Line Co.—16½ miles, 10-in., under way, Scurry County, Texas; O. R. Burden, contractor, Bill Price, spreadman.

West Coast Pipe Line Co.—20-in., planned, Permian basin, West Texas, to California.

Products Pipe Lines

Great Lakes Pipe Line Co.—39 miles, 12-in., under way, Hawarden, Iowa, to Sioux Falls, S. D.; Midwestern Constructors, Inc., contractor, R. C. Stanley, Canton, S. D.

Great Lakes Pipe Line Co.—355 miles, 12-in., authorized, Kansas City through Omaha and Sioux City, Iowa, to Sioux Falls, S. D.

Phillips Petroleum Co.—281 miles, 10-in., proposed, Borger, Tex., to Yale, Okla.

Phillips Petroleum Co. and Shamrock Oil & Gas Co.—155 miles, 6-in., planned, extension on 600-mile line at Phillips, Tex., via La Junta, to Denver.

Pure Transportation Co.—100 miles, 6-in., proposed, Heath to Dayton, Ohio.

Salt Lake Pipe Line Co.—242 miles, 6-8-in., under way, Boise, Idaho, to Pasco, Wash. Completion date, December 1950.

Salt Lake Pipe Line Co.—140 miles, 8-in., contracted Boise, to Baker, Idaho; Bechtel Corp., contractor.

Salt Lake Pipe Line Co.—Contracted, Macco Corp., and Morrison-Knudson Co., Inc.

Salt Lake Pipe Line Co.—120 miles, 6-8-in., under way, Baker, Ore., to Pasco, Wash. Completed August 8, 1950; Pacific Pipeline & Engineers, Ltd., contractor, L. E. Robertson, LaGrande, Ore., spreadman.

Standard Oil Co. (Ohio) and Shell Oil Co.—56 miles, 8-in., under way, Lima to Springfield, Ohio; Tulsa Construction Co., contractor.

Susquehanna Pipe Line Co.—126 miles, 8⅝-in., under way, Toledo, Ohio, to Sarnia, Ont., Canada; H. L. Gentry Construction Co., contractor. James Mitchell, Toledo, Ohio, spreadman.

Natural-Gas Pipe Lines

Acme Natural Gas Co.—25½ miles, 10-in., contracted, Ellwood to Butler, Pa., to be completed December 15, 1950; Williams-Austin Co., contractor. Howard Bauer, Butler, Pa., spreadman.

Alabama-Tennessee Natural Gas Co.—35 miles, 8-in., authorized, Muscle Shoals to Decatur, Ala.

Atlantic Gulf Gas Co. (United Gas Pipe Line Co.).—1,530 miles, planned, Alabama-Florida-Georgia-South Carolina.

Central Kentucky Natural Gas Co.—42 miles, 20-in., under way, North Means compressor station to Foster, Ky; completion date December 15, 1950; Williams-Austin Co., contractor, Leman Creech, Mt. Sterling, Ky., spreadman.

Chicago District Pipe Line Co.—41 miles, 24-in., authorized, loop Calumet pipe line—Joliet, Ill., to Chicago, completion date December 1950.

City of Indianapolis, Inc.—22 miles, 16-in., proposed, Indianapolis to Panhandle Eastern Corp. system.

Coast Counties Gas & Electric Co.—40 miles, 3-4-8-in., considered, coast and valley region, California.

Coastal Pipe Line Co.—1,000 miles, planned, Texas to Norfolk, Va.

Commonwealth Natural Gas Corp.—84 miles, 12-in., contracted, Richmond to Newport News, Va.; Ray L. Smith, contractor.

Commonwealth Natural Gas Co.—20 miles, 8-in., contracted, James River to Newport News, Va.; Ray L. Smith, contractor.

Commonwealth Natural Gas Corp.—104 miles, 18-in., under way, Standardsville to near Petersburg, Va.; Ray L. Smith & Son, contractor, Don C. Smith, Orange, Va., spreadman.

Commonwealth Natural Gas Corp.—537 miles, 20-in., proposed, West Bend, Ky., to Norfolk, Va.

Consolidated Gas Utilities Corp.—41 miles, 12-in., planned, Enid to Blackwell, Okla., Marlow to Cement, Okla.

East Ohio Gas Co.—24 miles, 20-in., authorized, northeastern Ohio to near Petersburg to East Ohio's Austintown station near Youngstown.

East Tennessee Natural Gas Co.—100 miles, planned, lateral to be laid in 1950.

East Tennessee Gas Corp.—150 miles, 16-in., under way, Knoxville to Bristol, Tenn.

East Tennessee Natural Gas Co.—398 miles, 3-16-in., planned, Nashville to Chattanooga to Knoxville, Tenn., and laterals.

East Tennessee Natural Gas Co.—106 miles, 12-16-in., contracted, Lobelville to Tullahoma, Tenn.; Oman Construction Co., contractor.

East Tennessee Natural Gas Co.—130 miles, 12-in., under way, Athens, via Chattanooga.

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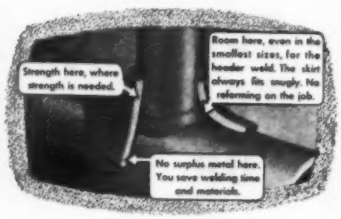
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East Tennessee Natural Gas Co.—120 miles, 12-in., planned, Chattanooga to Knoxville, Tenn.; Walters & Saigh Construction Co.

East Tennessee Natural Gas Co.—185 miles, 16-in., planned, Lobelville to Chattanooga, Tenn., Walters & Saigh Construction Co.

Eastern Natural Gas Corp.—292 miles, 24-in., proposed, Phoenixville, Pa., via New Haven and Hartford, Conn., Providence, R. I., Springfield, Mass., and Boston.

Egyptian Natural Gas Co.—80 miles, 6-8-in., planned, Norris City to Salem-Centralia, Ill., area.

El Paso Natural Gas Co.—352 miles, 30-in., under way, looping of 26-in., New Mexico-California line and connection with Pacific Gas & Electric Co. at Needles, Calif., to be completed November 1950.

El Paso Natural Gas Co.—450 miles, 24-in., authorized, San Juan basin, New Mexico, to Franconia, Ariz., to be completed November 1951 by company crews.

Home Gas Co.—70 miles, planned, Orange, Sullivan, Rockland, and Cattaraugus counties, New York.

Humble Oil & Refining Co.—50 miles, 8-in.; Trawick field to near Longview, Tex.; Trojan Construction Co., contractor.

Jersey Central Power & Light Co.—39 miles, 10-in., planned, New Jersey coast system of Texas Eastern Transmission Co.'s Big Inch.

Magnolia Petroleum Co.—60 miles, 4-24-in., gathering system in LaWard and Lolita fields, Texas; Henry L. Lemons & Co., contractor. W. A. Remington, spreadman.

Michigan Gas Storage Co.—150 miles, 20-in., planned, Chelsea terminal-Winterfield and Cranberry Lake, Mich.; Mahoney Contracting Co., contractor.

Michigan-Wisconsin Pipe Line Co.—197 miles, 6-18-in., under way, Milwaukee to Green Bay and Two Rivers, Wis.; G. G. Griffis Construction Co., contractor. F. K. Egan, Fond du Lac, Wis.

Mississippi River Fuel Corp.—40 miles, 18-in., authorized, Dubach to Perryville, La.

Montana-Dakota Utilities Co. and Montana-Wyoming Gas Pipe Line Co.—335 miles, 12¾-in., under way, Worland, Wyo., to Baker, Mont.; R. A. Conyes Construction Corp., contractor. Al Poggi, Hardin, Mont., superintendent.

New York State Natural Gas Corp.—42 miles, 20-in., Ohio-Pennsylvania line to Bakerstown, Pa.; Tulsa-Williams Co., contractor. O. L. Martin, Darlington, Pa., spreadman.

New York State Natural Gas Corp.—21 miles, 20-in., under way, Tonkin station to Bakerstown, Pa., to be completed December 1, 1950; Williams-Austin Co., contractor. Ralph Gaddy, New Kensington, Pa., spreadman.

New York State Natural.—164 miles, 16-in., planned, Ithaca to Albany, N. Y.

New York State Natural Gas Corp.—70 miles, 20-in., planned, North Oakford, Pa., to Ohio state line.

Niagara Mohawk Power Corp.—35½ miles, 10-14-in., under way, Therm station, to Fulton, N. Y.; Williams-Austin Co., contractor. Howard Bauer, Nedrow, N. Y., spreadman.

Northern Natural Gas Co.—597 miles, 20-26-in., contracted, ten loops from Texas to northern Iowa.

Northern Natural Gas Co.—76 miles, 4 to 12-in., under way, gathering line in vicinity of Hugoton, Kans., Cheek Construction Co., contractor, Troy Cheek, Ulysses, Kans., superintendent.

Northern Natural Gas Co.—111 miles, 24-in., under way, Ogden, Iowa, to St. Paul, Minn.; R. B. Potashnick, contractor.

Northern Natural Gas Co.—75 miles, 26-in., under way, north of Beaver, Okla.; R. H. Fulton & Co., contractor of Loop 2. Merele Lewellen, Mead, Kans., spreadman.

Northern Natural Gas Co.—33 miles, 26-in., contracted, Mullinville, Kans., station; R. H. Fulton & Co., contractor of Loop 3.

Northern Natural Gas Co.—72½ miles, 26-in., under way, Bushton to Minneapolis, Kans.; R. H. Fulton & Co., contractor of

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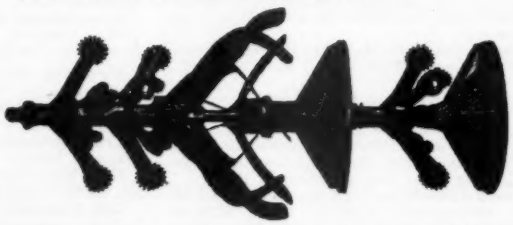

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Northern Natural Gas Co.—155 miles, 20-in., contracted, Garden City to Bushton, Kans.; R. H. Fulton & Co., contractor of Loop 5. Jerry Nash, Garden City, Kans., spreadman.

Northern Natural Gas Co.—43 miles, 26-in., under way, Palmyra, Neb., station to Oakland, Iowa, station; Midwestern Construction Co., Inc., contractor of Loop 6. M. T. Wilhite, superintendent.

Northern Natural Gas Co.—31 miles, 26-in., under way, north of Ogden, Iowa; R. B. Potashnick Co., contractor of Loop 8. H. F. Carr, Ventura, Iowa, spreadman.

Northern Natural Gas Co.—41 miles, 26-in., contracted, northward from Ventura, Iowa, station; R. B. Potashnick Co., contractor of Loop 9.

Northern Natural Gas Co.—40 miles, 26-in., contracted, Ventura, Iowa, station; R. B. Potashnick, contractor of Loop 10.

Northern Natural Gas Co.—222 miles, 26-in., under way, Borger, Tex., to Nebraska line; R. H. Fulton & Co., contractor. M. C. Boyd, Ashland, Kans., spreadman.

Northwest Natural Gas Co.—750 miles, planned, Washington, Oregon, and Idaho.

Ohio Fuel Gas Co.—22 miles, 16-in., authorized, Dayton, Troy, Piqua, and Sidney, Ohio.

Pacific Gas & Electric Co.—47 miles, 8-in., authorized, Salinas to Kilig City, Calif.

Pacific Gas & Electric Co.—506 miles, 34-in., under way, Topock, Ariz., to Milpitas, Calif.; Bechtel-Price-Conyes Corp., contractor. R. L. Bowman, general superintendent.

Pacific Lighting Corp.—23 miles, 30-in., planned, Inglewood to Encino, Calif.

Pacific Lighting Corp.—41 miles, 30-in., planned, Puente to March Field, California, to be completed 1950.

Pacific Northwest Pipe Line Co.—400 miles, 22-in., gathering lines on Texas Gulf Coast to Pacific Northwest pipe line.

Pacific Northwest Pipe Line Corp.—2,175 miles, 26-in., authorized, Texas Gulf Coast to Pacific Northwest.

Panhandle Eastern Pipe Line Co.—356 miles, 26-in., authorized, looping in Texas, Oklahoma, Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan.

Phillips Petroleum Co.—118 miles, 3-22-in., under way, Sherman and Hansford counties, Texas, gas-gathering system; Vaughn & Taylor Construction Co., Inc., Texhoma, Okla.

Piedmont Natural Gas Co.—1,350 miles, 20-in., planned, Greenville, Miss., to Carolinas.

Plains Natural Gas Co.—120 miles, 4-24-in., contracted, Oklahoma-Kansas area, Hugoton field, gathering system; Midwestern Constructors, Inc., (Arey-Phillips Construction Co.) contractor. T. S. Nunley, Liberal, Kans., chief inspector.

Potomac Gas Co.—18 miles, 16-in., planned, Dranesville to Arlington, Va.

Prince George's Gas Corp.—20 miles, 22-in., authorized between Chillum and Rockville, Md.

Roanoke Pipe Line Co.—30 miles, 8-in., authorized, Gala, Va., to Roanoke.

San Diego Gas & Electric Co.—53 miles, 16-in., planned, San Diego County, California.

San Diego Gas & Electric Corp. (Southern Counties Gas Co.)—85 miles, authorized, San Diego, Riverside, and Moreno, California.

South Central Alabama Natural Gas Co., Inc.—150 miles, proposed, central Alabama.

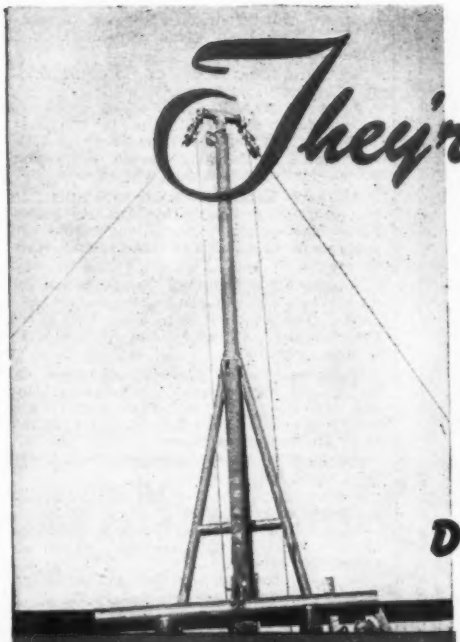
South Georgia Natural Gas Co.—248 miles, planned.

South Jersey Gas Co.—75 miles, 10-12-14-in., under way, Pleasantville, N. J., to Bustleton, Pa.; G. G. Griffis, Inc., contractor, Ray Abney, Millville, N. J., spreadman.

South Jersey Gas Co.—14-in., under way, Franklinville to Bridgeton, N. J.; G. G. Griffis, Inc., contractor.

Southwestern Michigan Gas Co.—55 miles, 12¾-in., proposed, Oakland County to Marysville, Mich.

Southern California Gas Co.—83 miles, 30-in., under way, Whitewater, Riverside County, to Puente, Los Angeles County, California; Midwestern Constructors, joint



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Manufactured with all the care and precision accorded a fine watch, WECO SNATCH BLOCKS have the brute strength to handle your heavy-duty hoisting requirement.

For "snaking" heavy equipment around the drilling rig or in the supply yard . . . for use on truck "A-Frames" . . . for pipe line tractor side booms and scores of other services, WECO SNATCH BLOCKS are unsurpassed.

Their ¾" steel plate shell plates resist distortion. Forged steel sheave, accurately machined and gaged assures longer rope life. Weco designed, forged steel, heat treated hook keeps entire weight of load centered through block. Line cannot slip between sheave and side plates. Ample clearance between sheave and trunion provides full clearance for line.

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Crose pipe cutting and beveling machine for fast true cutting and beveling of pipe. Available in six sizes for 4" to 36" pipe. All machines are built of high strength, light weight aluminum alloys. The continuous ring which goes around the pipe is hinged so that these machines may be installed as easily from the side of the pipe as from the end. Machines for 16" pipe and above have "Out-of-Round" attachment as standard equipment.

WRITE FOR BULLETIN BM-1001

M. J.

CROSE

MANUFACTURING CO., INC.

2715 Dawson Road Tulsa, Okla.

contract with Johnson Western Gunite—L. E. Dixon. John Work, Banning, Calif., superintendent.

Southern Counties Gas Co. of California.—81 miles, 20-in., authorized, looping.

Southern Natural Gas Co.—32 miles, 16-in., under way, Wetumpka to Tallassee, Ala.; completion due December 1; Sheehan Pipe Line Construction Co., contractor, C. M. Brown, spreadman.

Southern Natural Gas Co.—180 miles, 18-in., under way, Gwinville, Miss., to Selma, Ala.; Sheehan Pipe Line Construction Co., contractor. Jim Brown, Meridian, Miss., spreadman.

Southern Natural Gas Co.—24 miles, 24-in., under way, loops to Mississippi, Alabama, Georgia; Sheehan Pipe Line Construction Co., contractor. Jim Brown, R. H Brown, spreadmen.

Southern Natural Gas Co.—85 miles, 18-in., under way, Mississippi-Alabama state line to Selma, Ala.; completion due November 15; Sheehan Pipe Line Co., contractor. C. M. Brown, spreadman.

Southern Natural Gas Co.—110 miles, 11-in., considered, extension.

Southern Natural Gas Co.—118 miles, 13-in., planned, extension.

Southern Natural Gas Co.—138 miles, 20-22-in., planned, Chattanooga, Tenn., to Lexington, Miss.

Southern Natural Gas Co.—171 miles, 16-planned, extension.

Southern Natural Gas Co.—225 miles, 16-in., planned, Colfax, Ga., extension.

Southern Natural Gas Co.—314 miles, 18-in., planned, extension.

Southern Natural Gas Co.—375 miles, 24-in., planned, Gwinville, Miss., to Atlanta, Ga.

Southern Union Gas Co.—78 miles, 8-10-14-in., planned, New Mexico loops and laterals.

Tennessee Gas Transmission Co.—102 miles 16-in., under way, Bayou Sale to Kinder, La.; Latex Construction Co., contractor H. L. Leake, superintendent.

Tennessee Gas Transmission Co.—700 miles, 20-26-in., planned, Burnaugh, Ky., to Massachusetts including 400-mile line to Buffalo.

Tennessee Gas Transmission Co.—95 miles, 20-in., under way, Natchitoches to Kinder, La.; Latex Construction Co., contractor. F. A. Silar, superintendent.

Tennessee Gas Transmission Co.—992 miles, 30-in., planned, first 150 miles of loops to be laid at Monroe, La., Greenville, Miss., Midland and Portland, Tenn.

Tennessee Gas Transmission Co.—70 miles, 26-30 in., contracted, between Stations 104 and 110; Anderson Brothers Corp., contractor. E. C. McCoy and Arkie Hobson, Richmond, Ky., spreadmen.

Tennessee Gas Transmission Co.—174 miles, 30-in., under way, western Tennessee and Kentucky; Price-Morrison, contractor. Jack Hodges and R. L. McMillon, superintendents.

Tennessee Gas Transmission Co.—74 miles, 30-in., under way, from near Glasgow northeastward to near Lebanon, Ky; Morrison Construction Co., contractor. R. L. McMillon, Adamsville, Tenn., spreadman.

Tennessee Gas Transmission Co.—28 miles, 30-in., under way, near Scottsville, southwestward to near White House, Tenn.; Morrison Construction Co., contractor. R. L. McMillon, Adamsville, Tenn., spreadman.

Tennessee Gas Transmission Co.—99 miles, 30-in., under way, near Dickson, southwestward to near Selmer, Tenn.; H. C. Price, contractor. Jack Hodges, Linden, Tenn., spreadman.

Tennessee Gas Transmission Co.—170 miles, 26-30-in., contracted, Kentucky; Anderson Brothers Corp., contractor.

Texas Eastern Transmission Corp.—1,400 miles, 26-in., planned, Texas to Pittsburgh, loops.

Texas Gas Transmission Corp.—33 miles, 12-in., authorized, Slaughters, Ky., to Evansville, Ind.

Texas Gas Transmission Corp.—723 miles, 26-in., under way, Lisbon, La., to Middletown, Ohio.

Texas-Illinois Natural Gas Pipeline Co.—58 miles, 20-in., lateral from Joliet termi-

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Personal Supervision on Construction of Your

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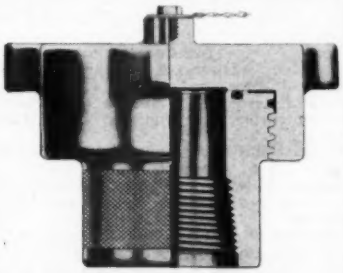

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nal to connection with Natural Gas Pipeline Co. of America near Volo, Ill.

Texas-Illinois Natural Gas Pipeline Co.—1,300 miles 30-in., under way, Corpus Christi area to Joliet, Ill.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 26-in., La Gloria to Refugio, Tex.; Midwestern Constructors, Inc., contractor of Schedule 1. M. T. Wilhite, superintendent.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 30-in., under way, Mississippi River to Effingham, Ill.; Midwestern Constructors, Inc., contractor of Schedule 11. John Work, superintendent.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 30-in., to start in 1951, Effingham to Sibley, Ill.; Midwestern Constructors, Inc., contractor to Schedule 12.

Texas-Illinois Natural Gas Pipeline Co.—93 miles, 30-in., to start in 1951; Sibley to Joliet, Ill.; Midwestern Constructors, Inc., contractor of Schedule 13.

Texas-Illinois Gas Pipe Line Corp.—409 miles, 30-in., contracted, Arkansas and Missouri; Bechtel Corp. A. M. Berlander, general superintendent.

Texas-Illinois Gas Pipe Line Corp.—126 miles, 30-in., contracted; H. C. Price, contractor. Work under way.

Texas-Illinois Gas Pipe Line Corp.—113 miles, 30-in., contracted; H. C. Price, contractor. Work under way.

Texas-Illinois Gas Pipe Line Corp.—97 miles, 26-in., contracted; H. C. Price, contractor. Work under way.

Texas-Illinois Gas Pipe Line Corp.—36 miles, 24-in., contracted; H. C. Price, contractor. Work under way.

Texas-Illinois Gas Pipe Line Corp.—38 miles, 12-in., contracted; H. C. Price, contractor. Work under way.

Transcontinental Gas Pipe Line Corp.—1,840 miles, 30-in., under way, Rio Grande Valley, Texas, to New York City.

Transcontinental Gas Pipe Line Corp.—80 miles, 10-14-in., underway, Mercedes to south of Falfurrias, Tex.; Massey Construction Co., contractor of Schedule A.

Transcontinental Gas Pipe Line Corp.—106 miles, 24-in., under way, south af Falfurrias to Edna, Tex.; H. B. Zachry Co., contractor of Schedule B.

Transcontinental Gas Pipe Line Corp.—93 miles, 30-in., under way, Porters to Deweyville, Tex.; Texas Southern Contracting Co., contractor of Schedule D. Merle Tatum, Liberty, Tex., spreadman.

Transcontinental Gas Pipe Line Corp.—81 miles, 30-in., under way, Sabine River, to Eunice, La.; Anderson Bros. Corp., contractor of Schedule E.

Transcontinental Gas Pipe Line Corp.—100 miles, 30-in., under way, Catawba River, North Carolina, to North Carolina-Virginia boundary; R. H. Fulton & Co., contractor of Section 9. A. A. Corrigan and Clark Williams, superintendents.

Transcontinental Gas Pipe Line Corp.—86 miles, 30-in., under way, North Carolina-Virginia boundary to James River, Virginia; O. R. Smith Contracting Corp., contractor of Section 10. R. M. Jones, Altavista, Va., spreadman.

Transcontinental Gas Pipe Line Corp.—110 miles, 30-in., under way, James River, Virginia, to Potomac River, Virginia; O. R. Smith Contracting Corp., contractor of Section 11. C. C. Craig, Herndon, Va., spreadman.

Transcontinental Gas Pipe Line Corp.—75 miles, 30-in., contracted, Potomac River to Susquehanna River; Associated Pipe Line Contracting, Inc., contractor of Section 12. Cecil Rogers, Towson, Md., spreadman.

Transcontinental Gas Pipe Line Corp.—90 miles, 30-in., contracted, Susquehanna, Pa., to Delaware River; Wunderlich & Griffis Construction Co., contractor of Section 13.

Transcontinental Gas Pipe Line Corp.—61 miles, 30-in., contracted, Delaware River to Hackensack River, New Jersey; Wunderlich & Griffis Construction Co., contractor of Section 14.

Transcontinental Gas Pipe Line Corp.—23 miles, 30-in., under way, Edgewater to Elizabeth, N. J.; Oklahoma Contracting Co., contractor to Schedule 15. Louis Visentine, Edgewater, N. J., superintendent.

Transcontinental Gas Pipe Line Corp.—98 miles, 6-14-in., under way, Wharton, Tex., area; Altgelt Construction Co., contractor, Texas Unit 1.

Transcontinental Gas Pipe Line Corp.—58 miles, 4-14-in., under way, El Campo, Tex., area; T & R Construction Co., contractor, Texas Unit 1.

Transcontinental Gas Pipe Line Corp.—38 miles, 4-8-in., under way, Sinton, Tex., area, Shanks & Eustace, Inc., contractor, Texas Unit 2.

Transcontinental Gas Pipe Line Corp.—61 miles, 6-10-in., under way, Dix, Tex., area; Victoria Oil Field Maintenance Co., contractor, Texas Unit 2.

Transcontinental Gas Pipe Line Corp.—50 miles, 18-20-in., under way, Eunice, La., to the south; Texas Southern Contracting Co., contractor, Texas Unit 2. Jim Reed, Crowley, La., spreadman.

Transcontinental Gas Pipe Line Corp.—380 miles, 8-16-in., planned, laterals to gas field.

Transcontinental Gas Pipe Line Corp.—85 miles, 4-14-in., under way, South Louisiana; Latex Construction Co., contractor. J. B. Latham, Vinton, La., spreadman.

Transcontinental Gas Pipe Line Corp.—78 miles, 30-in., contracted, Delaware River to southwest; Ray L. Smith & Son, Inc., contractor. Joe L. Work, Newton, Pa., spreadman.

Trunkline Gas Co.—278 miles, 20-in., contracted, Valley of Texas; R. H. Fulton & Co., contractor.

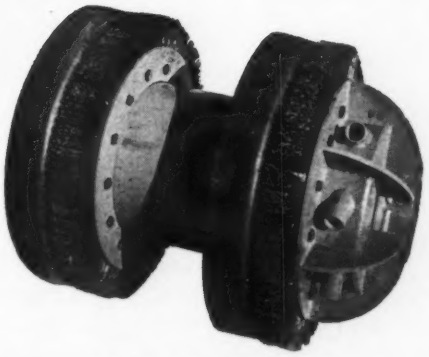
Trunkline Gas Co.—18 miles, 26-in., contracted, Mississippi, Tennessee, and Kentucky; R. H. Fulton & Co., contractor.

Trunkline Gas Supply Co.—1,775 miles, 10-26-in., planned, includes 740-mile, 26-in., Lake Charles, La., to Tuscola Station of Panhandle Eastern Pipe Line Co., and 1,035 miles, 10-24-in., Lake Charles, La., to McAllen, Tex., completion due October 1, 1952.

Williamson Gas Line Pigs* Traverse 1½R 90° Bends

← 24" Size New Design TYPE GP PIGS with Brushes Mounted on Arched Springs to Compensate for Wear

30" Size → Standard Design TYPE RCN-50 with Jet Rotation Feature to Distribute Wear



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Above Designs Available in 16" and Larger. Other Designs as Small as 2".

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Cable-strung cartridges of DU PONT SPECIAL OIL WELL EXPLOSIVE №1

speed loading...reduce hazards... lower costs

Extensive on-the-job tests have proved that Du Pont Special Oil Well Explosive No. 1 fractures even the densest strata with its tremendous spreading action . . . helps promote the free flow of oil to increase production.

Easy-to-load cartridges of Du Pont S.O.W.E. No. 1 are quickly strung on a cable. And because of the greater weight load which the cable carries, the number of entries into the hole is substantially reduced. Absence of torpedo shells facilitates clean-out, lowers over-all costs.

Du Pont S.O.W.E. No. 1 is the safest well explosive known. It will readily stand rough handling. Even the impact of a high-powered rifle bullet won't detonate it.

Your American Glycerin Section representative will gladly explain how Du Pont S.O.W.E. No. 1 will enable you to obtain maximum efficiency in shooting wells.

How cable-strung cartridges speed work

Each cartridge of Du Pont S.O.W.E. No. 1 has a hole running through its center from end to end. In assembling charges, the cartridges are strung on a steel cable. Prepared charges are then easily lifted and lowered as a unit into the well. Shells are unnecessary. This new improved method of loading permits making longer, more effective charges and substantially reduces clean-out time.

American Glycerin Section

Explosives Department

E. I. du Pont de Nemours & Co. (Inc.)

Tulsa 3, Oklahoma

DU PONT

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Among the

Drilling Contractors

Number of Active Rigs Breaks Previous Record

A NEW all-time "high" in the number of rotary rigs operating in the United States and Western Canada was reached during the week ended October 23 (latest survey). Active rigs during that week totaled 2,496, 39 more than the previous record number of 2,457 rigs reported during the week of November 22, 1948.

Although increased drilling activity in Western Canada has been an important factor in boosting the overall total to the new high level, the number of operating rigs in the United States alone during the currently reported week also set a new record, being four more than during the previous peak week of November 22, 1948. This has been due largely to the greatly increased drilling activity in the West Texas-New Mexico area, notably in Scurry and adjoining counties.

The number of operating rigs, which had been steadily increasing for 2 months, was 43 greater during the week ended October 23 than during the previous week, and 434 more than for the corresponding week a year ago. Increased activity was noted in all general areas except Kansas, Illinois and California. Most noted gain was on the Gulf Coast, where 24 more rigs were reported than during the previous week.

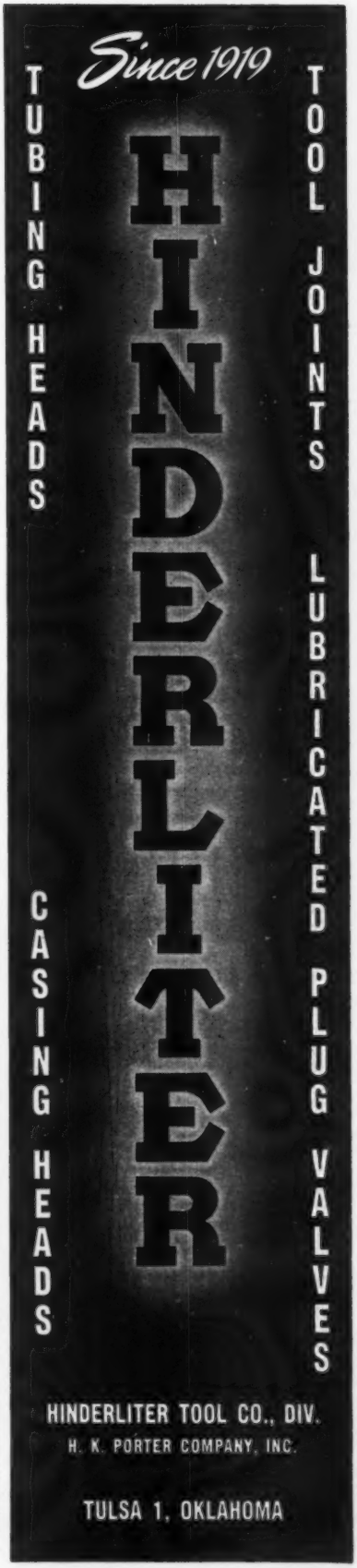
ROTARY RIGS IN OPERATION*
(United States and Western Canada)

Area—	Week ended 10-23-50	Change week ended 10-16-50	Change week ended 10-24-49
Gulf Coast	559	+24	+ 72
W. Tex.-N. M.	815	+ 1	+213
Ark.-N. La.-E. Tex.	149	+ 8	— 13
Oklahoma	298	+ 8	+ 67
Kansas-Nebraska	141	— 1	+ 25
Illinois-Eastern	162	— 3	+ 35
Rocky Mountains	126	+ 1	+ 25
Pacific Coast	138	0	— 28
Total U. S.	2,385	+38	+396
Western Canada	111	+ 5	+ 38
Total	2,496	+43	+434

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Pacific Coast and Illinois-Eastern areas are shown by charts on pages 132 and 133.

Melco Drilling Co., Seminole, Okla., has a rig working for Johnston Oil Co., Inc., Oklahoma City, in the drilling of a Cromwell sand test, 1 Factor, in an abandoned sector of the Little River pool, northern Seminole

Chock Younger (left), toolpusher, Fred M. Manning, Inc., Denver, and member of one of his crews on a rig now working for Stanolind Oil & Gas Co. in the active southeast extension development of the Velma pool, near Alma, Stephens County, southern Oklahoma. Crew members are: Standing, left to right, W. L. Scott, Ted Hamman (driller), and E. L. Bryne; seated, same order, John Hamman and J. R. Gains.



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The "VARCO" Drill Collar Clamp is a heavy duty safety device. No drill collar slips needed if used with heavy plate atop the master bushing. Movable slip inserts with VARCO buttons, complete within itself; no extra parts needed. For drill collar sizes 4½" to 8" inc. Chrome alloy heat treated steel. Write for complete data. A Tubing and Bailer Clamp of similar construction is available, handling sizes from 2⅜" to 4½".

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P. O. Box 748, Odessa, Texas

County, Oklahoma. Location is in the NE NW SE 13-7n-6e.

Parker Drilling Co., Tulsa, is drilling for Tide Water Associated Oil Co. at 1-D State, in 32-16s-37e, a mile east of the Lovington field, Lea County, New Mexico.

O. E. Hall, Wichita Falls, Tex., has moved in for a wildcat test to be drilled for Continental Oil Co. in the area 7½ miles southwest of Bridgeport, Wise County, North Texas. The test is 1 Bertha Flowers. Location is in the W. S. Blount Survey.

Mose Wagner is the contractor on a 3,600-ft. wildcat test being started by Northern Oil & Gas Co. in the Hingham area, Hill County, Montana. Location is on the Flink lease in 25-33n-10e. Rotary tools are being used.

C. W. Beene has a rig running for E. M. Self in the Joyce field, Winn Parish, Louisiana. Current operation is a Wilcox sand test, 1-A Tremont, located in the C NW NW 25-12n-2w.

Exploration Drilling Co., Dallas, has a rig working for Continental Oil Co. in northwestern Stonewall County, near the King County line, in West Central Texas. The operation is an Ellenburger exploratory test with contract for 7,100 ft. Location is on the Carothers lease in Section 139-F, H&TC Survey.

Quad Drilling Corp., Bossier City, La., has taken on a 6,500-ft. wildcat test to be drilled 3 miles northwest of Lost Prairie, in Miller County, Arkansas, for Sneed Brothers, Shreveport. Location is on the latters' Hervy lease in the NE NE NE 23-14s-26w. Objective at the contract depth is the Smackover lime.

H. F. Westcott, Oklahoma City, has a contract with California Exploration Co. for a well to be drilled in the recently opened West Prague pool, a mile northwest of Prague, Lincoln County, Oklahoma. The projected well, 1 Reel-Way, SE SE NW 19-12n-6e, is a northwest diagonal offset to the discovery well, drilled by Ned Biffle, and completed in the Misener sand at a total depth of 4,700 ft.

Edgar Davis, Abilene, Tex., has the contract to drill a 4,800-ft. wildcat test for Ryan Consolidated Petroleum Co. at 1 Lindeman, Block 527, John J. Eakin Survey, northeastern Runnels County, Texas.

McQueen & Clevenger Drilling Co., Fort Worth, has moved in for a 10,000-ft. Pennsylvanian wildcat test which will be drilled on contract for York & Harper, Inc., in northwestern Howard County, West Texas. The test is 1 Jones in Section 14, Block 34-2N, T&P Survey.

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For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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STANDCO BRAKE LINING

For the easiest brake known. It feeds off evenly. Standco never scores brake rims. See pages 3608-3613, Composite Catalog.

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Designed for the Man Who Has Everything

Plain 14 K Solid Gold as shown in cut.....$45.00
Same as above with 4 Sparkling Diamonds set in run-a-round....$85.00
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Plus 20% Excise Tax. Plus 3% Sales Tax if delivered in California. Sent by Registered Air Mail upon receipt of check, money order, or COD if you prefer.

Absolutely Guaranteed. Your Money Refunded by Return Mail If Not Entirely Satisfied.

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ALLOY STEELS CUT DRILLING COSTS

Above the ground and below, alloy steels more than justify their premium cost every day that they are in service. They are far tougher and stronger than carbon steels. They offer much greater resistance to abrasion—to the stresses and strains encountered in deep drilling operations. They resist corrosion, too. They stand *out* because they stand *up* under severe service, with less danger of costly breakdown.

Yes, from crown block to drill bits, and in draw-works, too—wherever moving parts must be tough, strong and long lasting—alloy steels are a low-cost investment in long-term economy.

Republic—world's largest producer of alloy and stainless steels—offers you prompt, competent assistance in determining where these versatile steels can effect the greatest savings for you. Write, wire or phone *today.*

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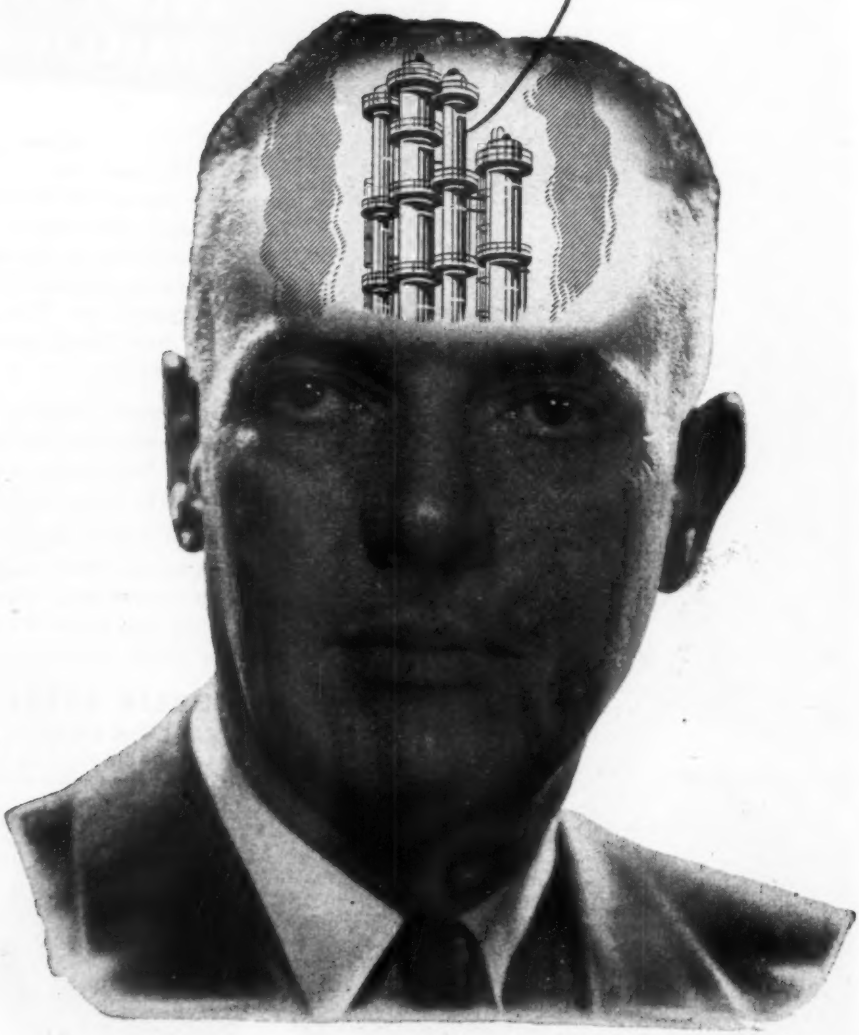

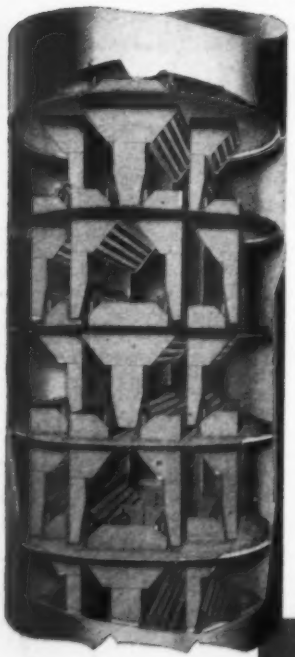

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REFINING

Avgas Totals Slump

WASHINGTON.—Production of aviation gasoline was off 15 per cent, and demand slumped 13 per cent during the first 7 months of this year compared with the same period last year. Figures released by the Bureau of Mines reveal that production was 23,198,000 bbl., a decline of 4,112,000 bbl. under the preceding-year period.

Demand for Avgas was 18,644,000 bbl. in the domestic market, representing a minor decline; but in the export market the drop was 40 per cent.

The trend was reversed in July when production was reported at 4,264,000 bbl., an increase of 17.4 per cent over the figure for the year-earlier month.

New Alcohol Unit

HOUSTON.—Construction has begun on a new unit to denature ethyl alcohol at Shell Chemical Co.'s huge $50,000,000 plant here.

The denaturing unit will supplement Shell Chemical's only existing denaturing plant, located at Sewaren, N. J., and will provide a more direct means of serving the regional market.

Denaturing of ethyl alcohol involves the adding of compounds to render it nonpotable. This will be done using various formulas. Denaturing of ethyl alcohol prior to its sale for commercial purposes is necessary to avoid payment of a federal tax by the customer.

The plant facilities will include five denaturant storage tanks; a one-story building housing denaturant weighing equipment, dry denaturant material storage, and other denaturant handling equipment; four denatured alcohol mixing and storage tanks; and loading spots for tank cars and tank trucks.

In conjunction with the denaturing plant, a proprietary solvent plant is being constructed. There "Neosel," a Shell Chemical Co. solvent used mainly in the plant industry, will be produced. Neosel is a mixture of ethyl alcohol and other solvents. The plant is to be a small one, and will consist of two tanks and pumps to effect the necessary mixing.

Resid Sales at High Level

Residual fuel sold for bunkering vessels in foreign trade during the month of August was at the highest level since December 1948, according to data by the Department of Commerce.

Heavy fuel, laden on vessels in foreign trade, amounted to 4,803,000 bbl. in August compared with 3,898,000 bbl. in July. Sales of diesel fuel for bunkers increased to 531,000 bbl. in August from 431,000 bbl. in July. Thus, increased shipping required about 1,000,000 bbl. more petroleum fuels in August than in July.

Rubber Plant Reactivated

PORT NECHES, Tex. — Schedules were broken by 20 days in reactivating the first of the nation's all-

NELSON REFINERY-CONSTRUCTION INDEX

Appears in the first issue of each month.
Explanation—Cost-imating No. 61, December 15, 1949, pages 91, 92.
Compiled by W. L. Nelson—Refinery Consultant—Tulsa.
Indexes of Individual Equipment Items—January, April, July, October.

INDEX (1946 = 100)

	1947	1948	1949	July 1950
Centrifugal pumps	109.0	120.0	118.9	123.7
Reciprocating pumps	128.5	138.1	144.6	139.6
Compressor	114.0	128.0	120.0	117.0
Engines	109.0	120.0	115.6	113.2
Motors	110.0	112.7	114.0	129.0
Transformers	116.0	116.0	116.0	110.1
Instruments	113.0	120.0	122.0	123.8
Miscellaneous equipment average	114.2	122.1	121.6	122.1
Materials component	122.4	139.3	143.6	148.0
Labor component	113.5	128.0	137.1	144.5
Refinery construction index	117.0	132.5	139.7	145.9

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purpose synthetic-rubber plants, to be operated by United States Rubber Co.

Designed to produce 60,000 long tons annually, the modernization program has increased the capacity to 72,000 long tons. October production is set at 1,500 long tons, to be increased gradually to 6,000 long tons monthly.

Reactivation and modernization was accomplished in less than 3 months, costing $1,030,000. Original cost of the plant was more than $11,000,000. It was completed in 1943.

Asphalt Stocks Lower

WASHINGTON.—Reserve stocks of asphalt declined more than 1 million barrels during the first 7 months of the year, according to the Bureau of Mines. The shrinkage was attributed to the 16.1 per cent increase in the domestic demand.

The domestic market absorbed 29,096,000 bbl. in the 7-month period this year, contrasted with 25,054,000 bbl. in the like period of 1949.

July demand was reported at 7,167,000 bbl., up 1,342,000 bbl., or 23 per cent, over last year. Production was only 6,453,000 bbl., representing a gain over last year of 1,316,000 bbl. or 25.6 per cent.

New Savannah Terminal

SAVANNAH. — Facilities to store 300,000 bbl. of petroleum products will be established by Southland Oil Corp., which has been granted a charter. Property at the state port has been leased from the State Port Authority specifying a 10-acre site for a 60-year period.

Tankers will bring petroleum products from Gulf Coast refineries. Construction of dock facilities and storage equipment is expected to take about 9 months. The project is reported to be financed strictly with Georgia capital.

Professors Meet Refiners

CHICAGO.—University professors, scientists, and engineers held a regional conference with experts of Sinclair Refining Co. at the company's research and development laboratory in Harvey, Ill., recently. Sinclair engineers were consulted regarding advances in the development of diesel lubricants and diesel fuels.

Schools represented at the conference were Illinois Institute of Technology, Northwestern University, University of Illinois, Evansville College, Purdue University, Tri-State College, Rose Polytechnic College, University of Notre Dame, Iowa State College, State University of Iowa, Marquette University, and University of Wisconsin.

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4 **Asbestos Felt**
5 **Materials for Special Uses**

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Barrett Pipeline Enamel is reinforced with inert flake minerals which provide toughness and maximum resistance to underground stress effects. It is non-absorbent, and is impermeable by soil waters. Like other Barrett coal-tar enamels, it is practically unaffected by soil composition or bacteria. It can be depended upon to give uniformly satisfactory service under the most punishing conditions of underground service.

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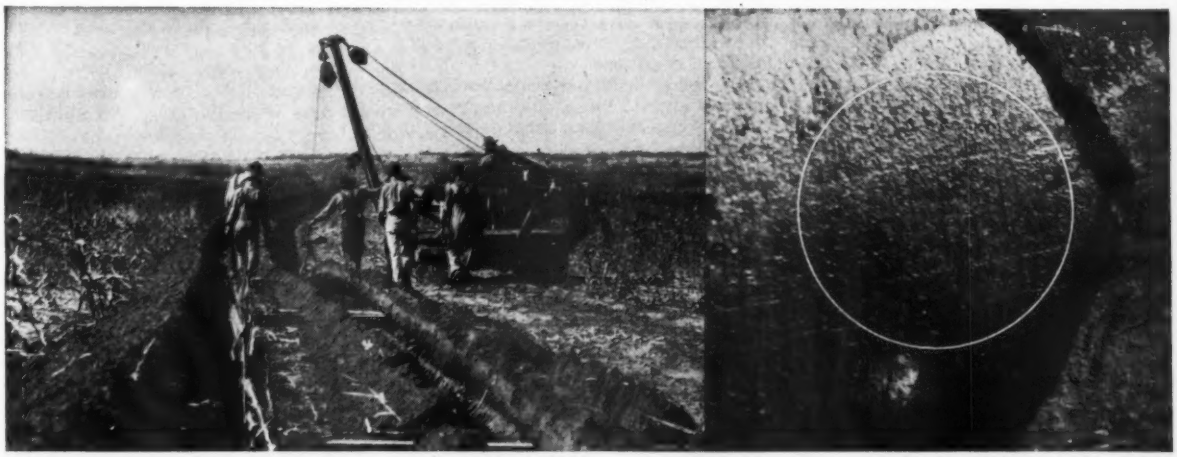

This line was protected in 1927 with Barrett Pipeline Enamel. When taken up for relocation 16 years later, the steel was found to be free from corrosion.

Note how clearly visible the original mill knurl marks are in this unretouched enlargement.

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NATURAL GAS

Expansion Plan Curtailed

WASHINGTON.—Natural gas will not reach new markets in the Georgia-South Carolina area as planned, since Southern Natural Gas Co. is sharply curtailing its expansion program, due to shortages in steel pipe and related equipment.

The proposed new markets were expected to benefit from an expansion program costing $32,500,000 through 1951. The company had planned to extend the western portion of its pipe line to connect with the Logansport and Carthage, Tex., gas fields.

Gulf Coast Gas to Canada

WASHINGTON.—Midstream in the Niagara River is the service point to which Gulf Coast natural gas will be delivered to Canadian distributors in a proposal being submitted to the Federal Power Commission. A new company, Niagara Gas Transmission Co., Ltd., has been organized to take over the flow from the Niagara River terminal.

Cost of the facilities to deliver the natural gas into the Toronto market is estimated at $6,000,000, with construction time estimated at 18 months. Initial volume on the proposed carrier would be 115,000,000 cu. ft. daily.

Local distributor in the Canadian city will be Consumer's Gas Co., which will buy the natural gas from its newly formed subsidiary, Niagara Gas. Delivery will be accepted at Port Credit, the present western limit of Consumer's territory.

Contracts to deliver the natural gas to the international boundary have been made with Tennessee Gas Transmission Co. The pipe line will have a capacity in excess of Toronto's needs, and plans are projected to service other communities.

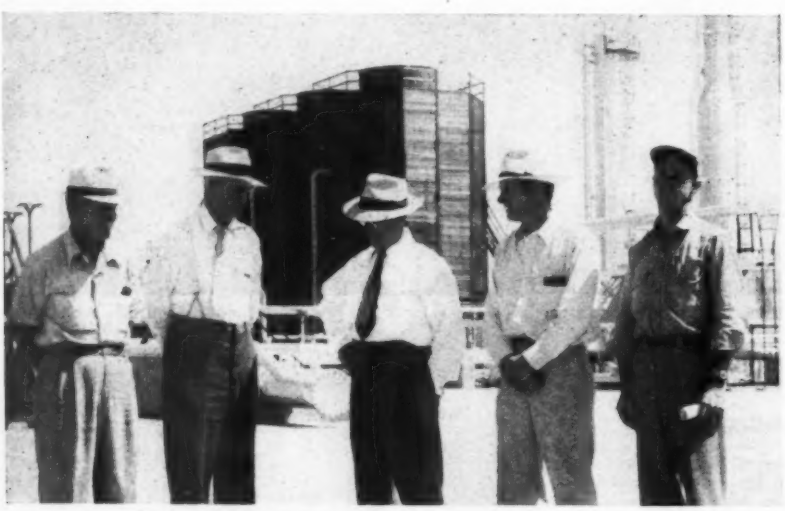
Directors of the new company are drawn from the boards of Consumer's Gas and Tennessee Gas. Both companies support the application to the Federal Power Commission.

Price Difference Asked

WASHINGTON.—Whether natural gas may have different values according to its use is the issue now being argued before the Federal Power Commission. Northern Natural Gas Co., Omaha, contends a different rate may be justly charged a utility company selling natural gas for industrial purposes and one selling the product for domestic consumption.

This stand is protested by two of Northern's customers, Minneapolis Gas Co. and Central Gas & Electric Co., Lincoln, Neb. Northern holds that it is proper for a distributing company to determine its wholesale charges by considering the use made of the natural gas. The resisting companies maintain that prices should be fixed regardless of use.

The issue is involved in Northern's application to the commission for authority to increase charges amounting to $3,200,000 yearly. This original request has been followed by a further application to increase the revenues by an additional $4,200,000, to become effective November 27. No precedent for the distinction in charges has been found in former commission hearings.



INSPECT GASOLINE PLANT.—Shown during an inspection tour of Richfield Oil Corp.'s new 30,000,000-cu. ft. natural-gasoline plant in the South Cuyama field of Santa Barbara County, California, are, left to right: B. G. Clark, area superintendent; C. E. Gotterba, general superintendent of gasoline plants, Bakersfield; H. R. Linhoff, manager of gas operations, Los Angeles; H. G. Pearson, plant foreman; and A. A. Quarnstrom, assistant general superintendent of gasoline plants, Bakersfield.

Firm Enters San Juan Area

CHICAGO.—Great Lakes Oil & Chemical Co. has entered the New Mexico natural-gas fields by acquiring acreage in the San Juan basin. This proven tract of approximately 4,800 acres gives the company a sizable reserve of natural gas.

A completed gas well has been developed on the property, flowing more than 2,000,000 cu. ft. daily. Estimated output after shooting is fixed at 15,000,000 cu. ft. daily. Reportedly the gas has a high B.t.u. content, rich in distillate, and with pressure in excess of pipe-line requirements.

The tract is in an area now being developed by Delhi Oil Co., Western Natural Gas Co., Hancock Oil Co., Southern Union Gas Co., and other companies. Recently El Paso Natural Gas Co. was granted a permit to construct a trunkline from the San Juan basin to California.

August Sales Higher

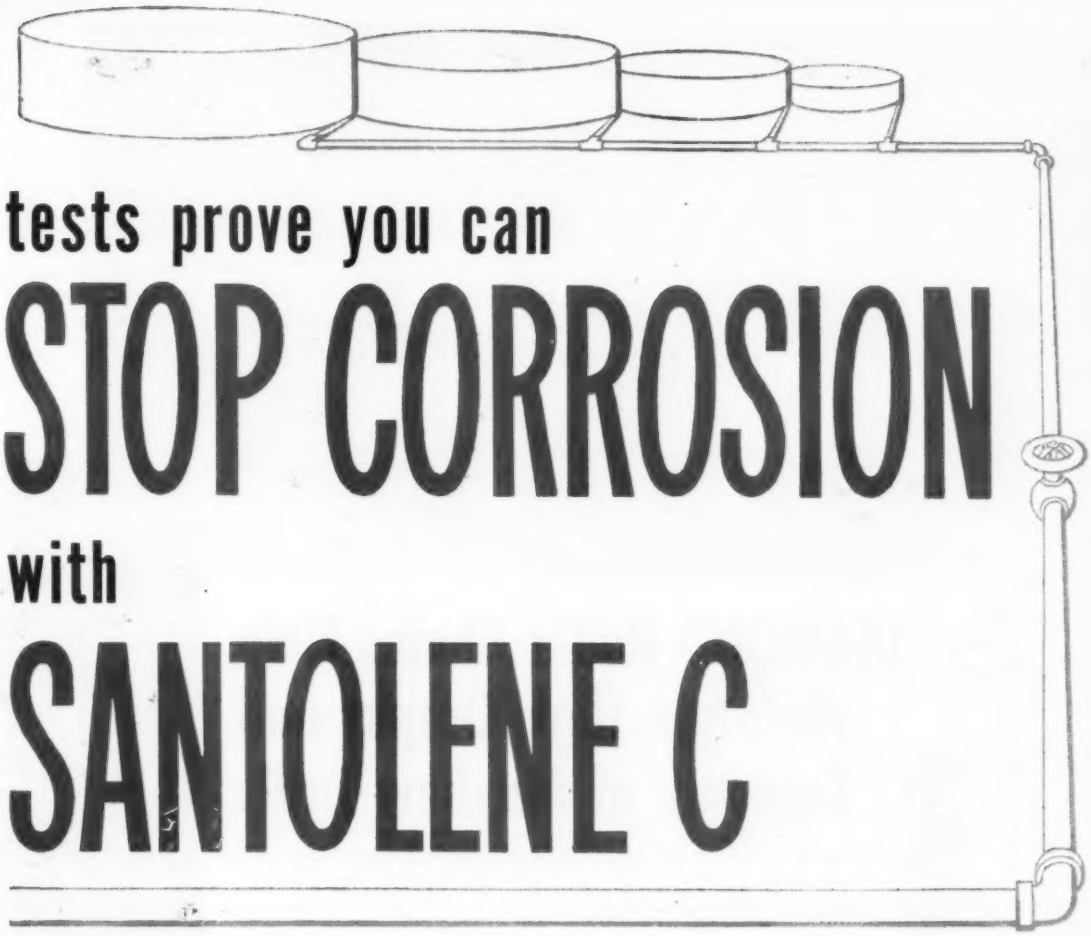
WASHINGTON.—Sales of natural gas for August represented an increase of 20.4 per cent over the same month last year, reaching a total of 131,567,000,000 cu. ft., figures released by the Federal Trade Commission show.

Sales to residential consumers increased 17 per cent. The largest demand came from industrial users, the year-earlier figure being topped by 22.4 per cent. Advance for commercial users was the lowest, being 10.7 per cent more than the preceding August.

Firm Accepts Identity

WASHINGTON. — Identity as a public utility has been accepted by Gulf Public Service Co., Inc., Lafayette, La., ending in part its controversy with the Federal Power Commission. The company distributes natural gas in Louisiana where federal authorities have sought to exert control.

Gulf withdrew its protests against being considered a public-utility company in its De Ridder-Leesville district, and its Crowley-Eunice and Jeanerette-New Iberia systems. The extent of federal control is yet to be determined in its De Quincy and Covington district systems. The issue involves the grasp of federal authority on local activities.



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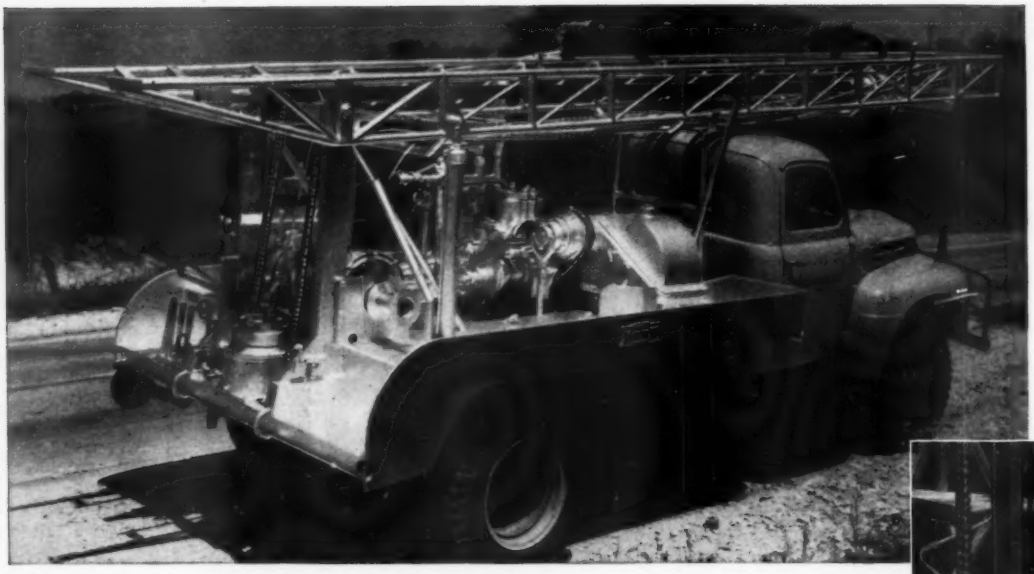
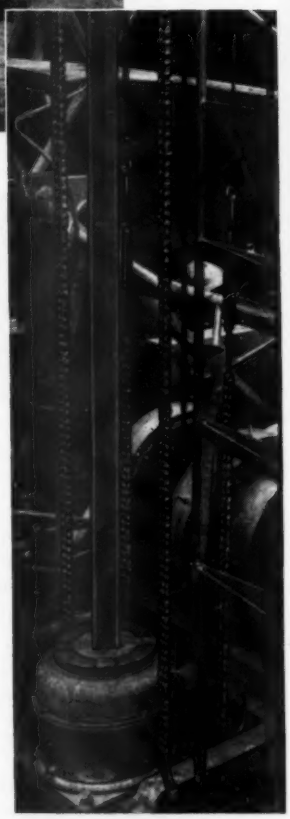
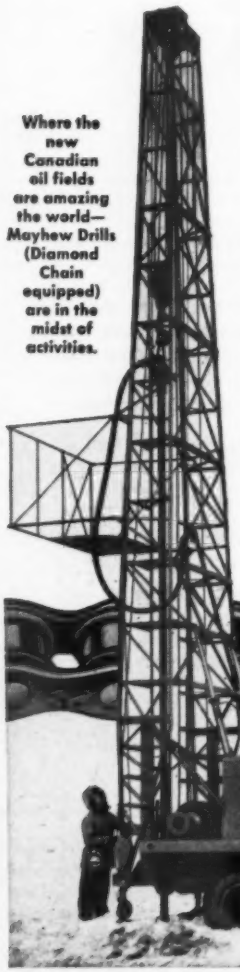


TRADE MARK

DIAMOND Roller Chains Help Maintain High Output and Economy of Mayhew Drills



Close-up of portion of Diamond Roller Chains on pull down.



Where the new Canadian oil fields are amazing the world—Mayhew Drills (Diamond Chain equipped) are in the midst of activities.

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Diamond Roller Chains again prove the value of their great reserve strength and uniform quality—link for link. They are used for the power take-off, pump, pull down, pull down drive and in the heart of the Mayhew Rig—the transfer case. Here a series of shafts are driven by Triple ¾" Pitch Roller Chain from which power is transmitted to the component units such as the rotary table and draw works.

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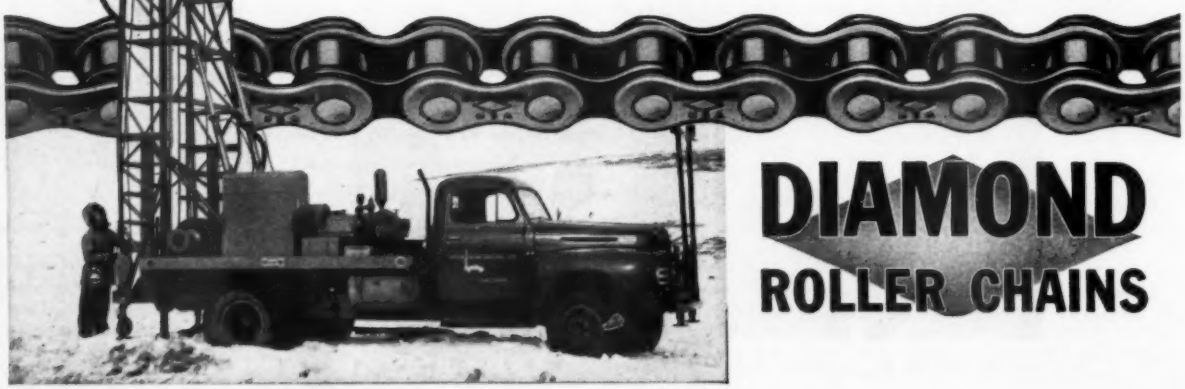

DIAMOND ROLLER CHAINS

New Ellenburger Area Excites Texans

THE outstanding potential of Star Oil Co.-Moore-Cook 1 Blanche Young, recently completed Ellenburger discovery well located in the southwestern part of Kent County, Texas, has suddenly directed excited attention toward the productive possibilities of the Ellenburger throughout an entirely new area. Star's discovery well is the first significant Ellenburger producer completed on the eastern platform of the Permian basin.

The Star well was completed for over 1,475 bbl. of 41°-gravity oil daily, flowing through a ¾-in. tubing choke. In all of the tests run to date on this well there is no evidence of the presence of any formation water. (Contrary to prevalent reports the Ellenburger was not acidized in the discovery well.) The hole was carried to a total depth of 7,822 ft. and 5½-in. casing was set 2 ft. below the top of the Ellenburger at 7,782 ft.

It is generally agreed that a substantial reservoir has been uncovered by the Star well, but its size, pay thickness, and the possibility of other large reservoirs from this formation in the immediate area is still anybody's guess.

This discovery well is located on the flank of a regional nose which extends northward through Kent and Garza counties to approximately the Crosby County line. Regional gravity surveys bear out this maximum feature, which trends in a northwesterly direction. Indications are that the discovery is separated by a syncline from Polar field, which has two small Ellenburger producers. Three dry holes have been drilled near the apex of this regional gravity high in the northwest corner of Kent County, but only one of these wells penetrated and tested the Ellenburger formation.

The Ellenburger was topped in the Star well at —5,458 ft., or about 50 ft. higher than a dry hole drilled 2½ miles to the south. The dry hole was completed in September 1946, after having penetrated shows of oil in both the Strawn and the top 100 ft. of the Ellenburger. This Ellenburger failure was completed prior to the discovery of oil in the deeper beds in the eastern platform region, and since no drill-stem tests were run of the Ellenburger it would be difficult to tell the type of reservoir conditions encountered in the dry hole. Shows in this dry hole may indicate that more than 100 ft. of additional section, undrilled by the Star well, may still be above the water table in the field, but whether or not this additional section will prove to be commercially productive must await further development in the area. The establishment of a water table in this area may be slow in developing because of the difficulty encountered in shutting off water in vertically fractured dolomites.

The reservoir characteristics of the Ellenburger are best known in the Central Basin platform region, and in the southern platform area. Although these two areas are over 100 miles distant from the new discovery, they offer the only comparisons available on past reservoir and productive performance for Ellenburger fields.

On the western platform Ellenburger structures usually are associated with steep dips, and carry gas and distillate caps of as much as 100 ft. in thickness at the top, with gas-oil ratios normally ranging upward to above 2,000 : 1. Since Star's well did not encounter any gas cap, and the gas-oil ratio on recent test has shown to be as low as 500 : 1, the indications are that the discovery well was not drilled on the peak of the structure. These facts, together with the variable contouring possibilities, indicate that the Star well may be on a local structure on the regional feature, and may be located some distance down the flank. If these ideas are borne out by future drilling, the possibility of other similar structures along the eastern flank of this regional nose appear probable.

The reason for the tremendous amount of interest shown in the Star discovery is its similarity to the original discovery of Ellenburger oil on the western platform during the early 1940's, and the intensive development program which followed the discovery of Canyon reef production on the eastern platform in 1947-48. Needless to say, a discovery of this magnitude might well be the spark to set off wildcat drilling which will ultimately establish sizable reserves of oil in the Ellenburger formation on the eastern platform. Since drilling for Ellenburger oil involves nominal depths and very little chert is encountered, the eastern platform play will probably be much more rapid than the development of Ellenburger reserves in the other areas.

Philip C. Ingalls

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

MISSISSIPPI.—Another Wilcox oil pool has been opened at Robert Oil Co. and Lyle Cashion 1 Davis heirs, 41-9n-2w, Jefferson County, which completed for 260 bbl. of oil per day through perforations at 5,535-37 ft. in the Artman sand. Another Wilcox pool is indicated at R. J. Bartlett-Barnett Serio 1 George W. Armstrong, 37-6n-3w, Adams County, which flowed oil at the rate of 4 to 6 bbl. per hour on test through perforations at 6,325-27 ft.

WEST TEXAS.—Northwest of Kelly-Snyder field, Magnolia Petroleum Co. 1-F McDonnell missed pay in both Canyon reef and Strawn limestone of the Pennsylvanian, but was showing for a possible Ellenburger discovery. Top of the latter formation was 8,033 ft., some 70 ft. high to Humble's Dermott discovery. Drill-stem test from 8,033-42 ft. recovered 105 ft. of clean oil, plus heavily oil-cut mud, with no water.

EAST TEXAS.—Another flush producer from Oil Creek sand (Simpson) has been found near Sandusky in Grayson County. Ada Oil Co.'s 1 Barnes flowed 15-20 bbl. of oil an hour through ⅜-in. bottom choke and ½-in. top opening. At last report it was coring ahead to the water, with a possible 31 ft. of oil sand.

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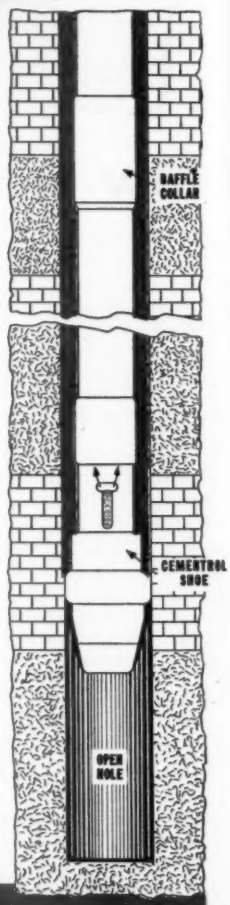
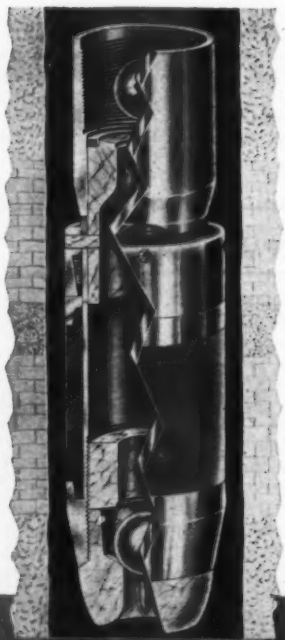
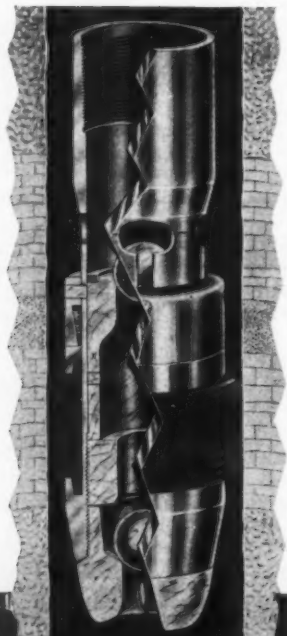


Here's how CEMENTROL does the job. The CEMENTROL Shoe puts cement right where it's wanted.

Cement shown in red.



Running-in position . . . serving only as a float Shoe.



Position after expansion by pump pressure.

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Kansas

Oil Showings Found by Thomas County Wildcat

WESTGATE-GREENLAND OIL CO. has run casing to test showings encountered in its 1 Herbel, a rank wildcat located in the NE NW NE 30-9-32, southern Thomas County, in the extreme northwestern part of the state.

Showings were in the Fort Scott member of the Marmaton group (Pennsylvanian), where a drill-stem test yielded 35 ft. of slightly oil-cut mud. Top of the prospective pay zone was logged at 4,468 ft. The interval tested was at 4,471-98 ft. Tester was open 60 minutes.

Following the test, hole was deepened to the Arbuckle lime with no additional showings being found. Total depth is 5,054 ft. Arbuckle was topped at 5,014 ft. Casing was run through the prospective pay zone to 4,559 ft.

Thomas County is in the middle of a large, little-explored region. Nearest production, located on the Central Kansas Uplift trend of pools, is more than 45 miles to the east. The small, shallow sand Shallow Water pool, 65 miles to the south in Scott County, is the nearest production in that direction.

Skelly Oil Co. 1 Powell, NW SE NE 2-13-10e, north offset to the discovery well, and first confirmation test, in the recently opened Mill Creek pool, Wabaunsee County, in the Forest City Basin, in the northeastern part of the state, is being put on the pump following swabbing tests in which it made up to 45 bbl. per hour. Its production is from Viola lime at 2,936-41 ft. (—1,834-39 ft.). The discovery well, 2 Thoewe, completed in the same pay, established a maximum potential of 3,000 bbl. per day.

Pabco Drilling Co. 1 Viney, SE SE SW 17-28-5, eastern Kingman County, swabbed 15 bbl. of oil with 35 bbl. of water in a resumption of tests following acidization. It opens another pool in the active Mississippian development play which has been going on in the Landsdown area along the Kingman-Sedgwick County line. The pay zone, topped at 3,837 ft., is open at 3,882-95 ft. Location is a mile northwest of the Broadway pool and 1½ miles southwest of the Landsdown pool, both of which were opened recently.

In Iowa, 7 miles south of Council Bluffs, Council Bluffs Oil Exploration Trust is drilling below 1,590 ft. at 1 Thieschafer. This rank wildcat is located in SE SE 6-73n-43w, and is scheduled to go to granite.

KANSAS SUCCESSFUL WILDCAT

Rooks County: L. Phillips-Strain 1 Schrandt, NE NE NW 4-10s-17w, elev. 2,095 ft., 582 bbl. of oil per day from Arbuckle at 3,529-34 ft., TD; anhydrite 1,355 ft., Topeka 3,003 ft., Heebner 3,197 ft., Lansing-Kansas City 3,239 ft., Simpson 3,510 ft.

KANSAS WILDCAT FAILURES

Barton County: Nadel & Gussman 1 Karse, SW SW NW 14-16s-15e, elev. 1,985 ft., dry, TD 3,543 ft., anhydrite 1,010 ft., Heebner 3,170 ft., Dodge 3,187 ft., Lansing-Kansas City 3,226 ft., Sooy 3,480 ft., Arbuckle 3,502 ft.

Butler County: Mayer et al 1 Church, NE SE SW 5-28s-5e, elev. 1,291 ft., dry, TD 2,778 ft., Lansing 1,880 ft., Kansas City 2,208 ft., Mississippi lime 2,765 ft.

Coffey County: Ray 1 Schoebleber, NW NW NE 33-23s-15e, dry, TD 1,640 ft., Mississippi 1,472 ft.

Dickinson County: Mouser Drilling 1 Longnecker, SW SW NW 34-12s-2e, elev. 1,264 ft., dry, TD 3,112 ft., Kansas City 1,720 ft., Burgess 2,292 ft., Mississippi chert 2,293 ft., Hunton 2,644 ft., Viola 2,890 ft., Simpson 3,040 ft., Arbuckle 3,093 ft.

Graham County: Peel-Hardman 1 Berland, NE NE NW 13-8s-21w, elev. 2,016 ft., dry, TD 3,600 ft., anhydrite 1,545 ft., Topeka 2,980 ft., Heebner 3,220 ft., lime 3,242 ft., Lansing-Kansas City 3,257 ft., Sooy 3,513 ft., Arbuckle 3,554 ft.

Greenwood County: Giffen 2 Moore. NE NE NE 35-26s-10e, dry, TD 2,123 ft., Kansas City 1,265 ft., Mississippi lime 2,054 ft.

Sauder et al 1 Courter, NE SW NE 5-27s-11e, dry, TD 1,904 ft., Mississippi lime 1,877 ft.

Kingman County: Pabco 1 Shoemaker, SE SE SW 9-28s-5w, elev. 1,406 ft., dry, TD 3,830 ft., lime 2,964 ft., Lansing-Kansas City 2,992 ft., Mississippi lime 3,791 ft., Mississippi dolomite 3,805 ft.

McPherson County: Penguin 1 Baughman, NW NE SW 25-18s-2w, elev. 1,546 ft., dry, TD 3,286 ft., Lansing-Kansas City 2,325 ft., Mississippi lime 2,970 ft., Kinderhook 3,265 ft.

Morris County: Atlas et al 1 Albritton, NW NW SW 24-15s-5e, elev. 1,422 ft., dry, TD 2,268 ft., Mississippi chert 2,166 ft., Mississippi lime 2,211 ft., Kinderhook 2,262 ft.

Ness County: Hartman 1 Scott, C NE NE 28-17s-26w, elev. 2,487 ft., dry, TD 4,518 ft., Lansing-Kansas City 3,853 ft., Sooy 4,401 ft., Mississippi lime 4,436 ft.

Pratt County: Lion 1 Nellie, SW SW SW 13-29s-14w, elev. 1,935 ft., dry, TD 4,654 ft.

Rooks County: Jones-Shelburne & Farmer 1 Carsten, NE NE SW 32-7s-17w, elev. 1,822 ft., dry, TD 3,350 ft., anhydrite 1,190 ft., Topeka 2,752 ft., Heebner 2,964 ft., Dodge 2,987 ft., Lansing-Kansas City 3,006 ft., Sooy 3,304 ft., Arbuckle 3,314 ft.

Gore 1 Carmichael, NE NE SE 32-8s-18w, elev. 2,025 ft., dry, TD 3,510 ft.

Stafford County: Jones-Shelburne & Farm-

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er 1 Dale, SW SW NE 10-23s-12w, elev. 1,840 ft., dry, TD 3,799 ft., anhydrite 620 ft., lime 3,301 ft., Lansing-Kansas City 3,325 ft., iVola 3,658 ft., Simpson 3,671 ft., Arbuckle 3,739 ft.

Adair 1 Scheib, NE NE NE 27-22s-12w, elev. 1,871 ft., dry, TD 3,703 ft., anhydrite 645 ft., Topeka 2,864 ft., Heebner 3,160 ft., lime 3,291 ft., Lansing-Kansas City 3,309 ft., Arbuckle 3,698 ft.

Trego County: Jones-Shelburne & Farmer 1 Hixson, SW SE SE 2-12s-23w, elev. 2,420 ft., dry, TD 4,198 ft., anhydrite 1,845 ft., Heebner 3,634 ft., Lansing-Kansas City 3,668 ft., Sooy 4,085 ft., Arbuckle 4,137 ft.

Mississippi

Jefferson County Gets New Wilcox Oil Field

JACKSON.—Robert Oil Co. and Lyle Cashion have brought in an important Wilcox discovery in southwestern Jefferson County. The operators' 1 Davis heirs, 41-9n-2w, has been completed from perforations at 5,535-37 ft. in the Artman sand. On potential test it flowed 260 bbl. of 44°-gravity oil in 24 hours on ¼-in. choke. Tubing pressure was 380 psi. and casing pressure 700 psi. The new field has been named Church Hill. Nearest production is Pine Ridge field, 4 miles south in Adams County. Pine Ridge production is from the same sand. Atlantic Refining Co., Kirby Petroleum Co., Pure Oil Co., and Humble Oil & Refining Co. have acreage surrounding the discovery.

R. J. Bartlett and Barnett Serio have a prospective Wilcox discovery 4 miles north of Glen Augin field, Adams County. Their 1 George W. Armstrong, 37-6n-3w, flowed oil and water by heads for 5 hours after being perforated in the McKittrick sand zone at 6,327-29 ft. These perforations have been squeezed and additional perforations higher up in the McKittrick at 6,325-27 ft. are scheduled to be made.

Clyde Moss and Frederic F. Mellen have plugged their 1 Sullivan L. Latham, SW SW 21-8n-6e, 3 miles south of Ludlow, Scott County. Total depth is 9,410 ft. Cores were taken between 5,204-276 ft. in the Eutaw, and between 8,652-62 ft. in the Glen Rose. Only salt water was recovered in both cases.

In Wayne County, Tip Ray is scheduled to drill a wildcat in NW SW 31-7n-8w, to a projected depth of 8,300 ft. Barnett Serio and Petersen Drilling Co. have staked location for a Wilcox test in Adams County, approximately 2 miles northwest of Glen Aubin field. Location is NW 15-5n-3w.

In Alabama, Hunt Oil Co. is testing the Selma Chalk section in its 1 Norden Swann, C SW NE 1-10n-4w, in Gilbertown field, Choctaw County. Hole has been drilled to total depth of 3,506 ft. and 5½-in. casing has been set to 3,350 ft.

MISSISSIPPI SUCCESSFUL WILDCAT

Jefferson County: Robert Oil Co. and Lyle Cashion 1 Davis heirs, 41-9s-2w, perf. 5,535-37 ft., TD 7,081 ft., 260 bbl. 44°-gravity oil per day, ¼-in. choke, TP 360 psi., CP 700 psi.

MISSISSIPPI WILDCAT FAILURES

Adams County: Dorris Ballew, Inc. 1 S. H. Lambdin et al, 38-8n-2w, dry, TD 6,005 ft.

Humble Oil & Refining Co. 1 Laura Butler, 15-5n-3w, dry, TD 11,159 ft.

Humble Oil & Refining Co. 1 Mrs. Roane F. Byrnes, 13-5n-3w, dry, TD 11,183 ft.

Holmes County: Joseph A. Poretto et al 1 Presley, 11-12n-3e, dry, TD 5,265 ft.

South Louisiana

Promising Wildcat Tests Gas-Condensate Flows

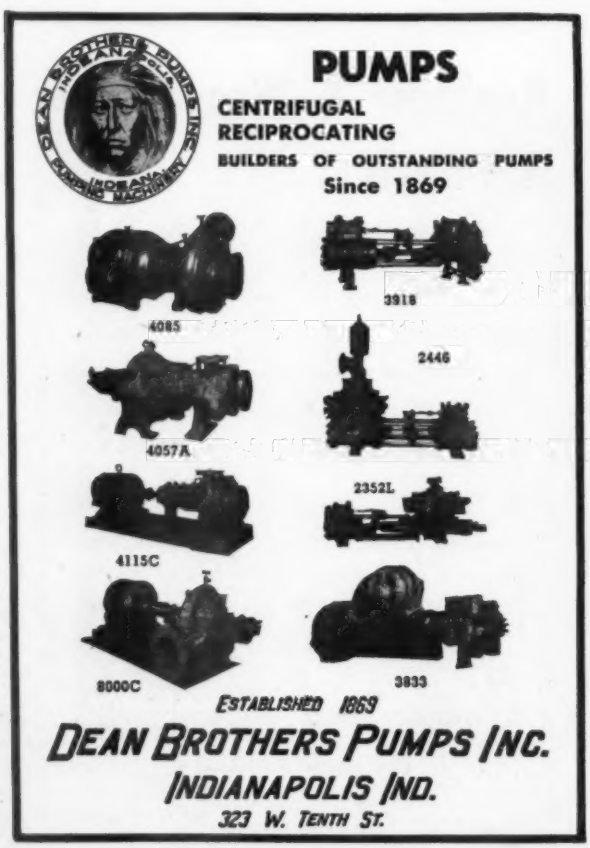
NEW ORLEANS.—Either a new field is being opened or Midland field of Acadia Parish is being extended 1½ miles west at Sun Oil Co. and Sohio Petroleum Co. 1 LeBlanc, 55-10s-2w. Latest gage on the well credits it with a flow of 2,300,000 cu. ft. of gas per day through 7/64-in. choke, with no gage on condensate flow. On a previous test it flowed both gas and condensate through a ⅛-in. choke with tubing pressure of 8,250 psi. Condensate was gaged at 129 bbl. per day. Operators continue to test through perforations at 11,574-82 ft. Prior to the above tests, the well flowed gas through perforations at 10,944-64 ft. These perforations were squeezed and another squeeze job effected from 11,465-67 ft.

Midland field was discovered earlier this year at Atlantic Refining Co. 1 Pearl R. Cowen, 18-10s-1w, which flowed 29 bbl. of 49.5°-gravity condensate through perforations at 10,994-11,004 ft.

A new producing Wilcox reservoir is indicated at Gulf Refining Co. and Humble Oil & Refining Co. 1 Ben J. Altheirmer es. tate et al, 13-4n-4e, 8½ miles west of Argo in Avoyelles Parish. Operators ran a drill-stem test from 5,900-06 ft. and recovered oil. The well was previously tested at 5,932-33 ft. with recovery being salt water. Hole is bottomed at 6,900 ft. and string of 5½-in. casing cemented at 6,388 ft.

Meanwhile, Gulf and Humble have staked location for 2 Ben J. Altheimer estate et al, approximately ½ mile due south of the prospective discovery. Rig will be moved on location as soon as testing operations are completed at the first well.

In Lake Pontchartrain, Ginther, Warren



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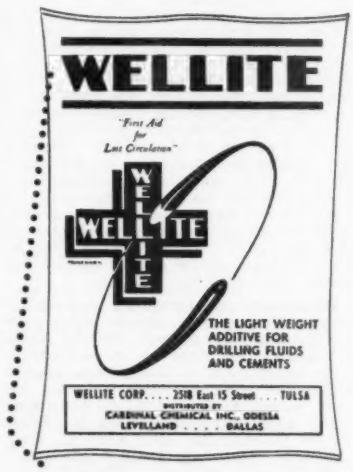
& Ginther have stopped at 10,030 ft., to run electrical survey for correlation purposes at their 1 State Lease 1,317, 41-11s-9e, St. Charles Parish. Contract depth for the wildcat is 10,500 ft.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: Bateman Drilling Co. et al 1 Powell Lumber Co., 2-7s-12w, 7½ mi. N Lucas, dry, TD 6,520 ft.

Vermilion Parish: Sohio Petroleum Co. 1 Odean Hebert, 8-11s-3e, 6 mi. N Abbeville field, dry, TD 11,503 ft.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Oklahoma

Bromide Oil Discovery For Comanche County

PROMISING oil and gas showings have been encountered by Tide Water Associated Oil Co. in its 1 Myers, wildcat test in the NE NE NW 10-4n-11w, northern Comanche County, in the southwestern part of the state. Showings were in Bromide sand, top of which was logged at 1,509 ft. after the entire Pennsylvanian section had been found missing.

An initial drill-stem test with hole bottomed at 1,513 ft., and taking in an interval from 1,493 ft., flowed gas at an estimated rate of 335,000 cu. ft. per day and yielded 90 ft. of gas-cut mud. With hole deepened to 1,561 ft., another drill-stem test was made in which oil flowed at an estimated rate of more than 5 bbl. per hour. In this test, the tool was open 1½ hours. Gas showed within 2 minutes after the tool was opened and flowed at an estimated rate of 3,000,000 cu. ft. per day. Oil was at the surface in 50 minutes and flowed until the tool was closed. Flowing pressure was 125 psi. and indicated bottom-hole pressure 630 psi. Approximately 245 ft. of oil and oil-cut mud, mostly oil, was recovered in the pipe break-down. Gravity of the oil was 36° A.P.I. Hole was being cored ahead at latest report.

The prospective discovery is on the southeastward trend from the Apache pool, and about 3 miles south and 2 miles east of the town of Apache, in southern Caddo County. It is north of shallow gas production in the Fort Sill pool and about 5 miles north of Fort Sill.

Another oil discovery is indicated in Pawnee County, in the central part of the state, where National Associated Petroleum Co. 1 O'Leary, NW SW SW 11-22n-4e, recovered free oil, amount unreported, in a drill-stem test of the Bartlesville sand at a total depth of 3,510 ft. Following the test, 5½-in. oil string was run to the top of the pay at 3,489 ft. With plug drilled out, production tests are being started.

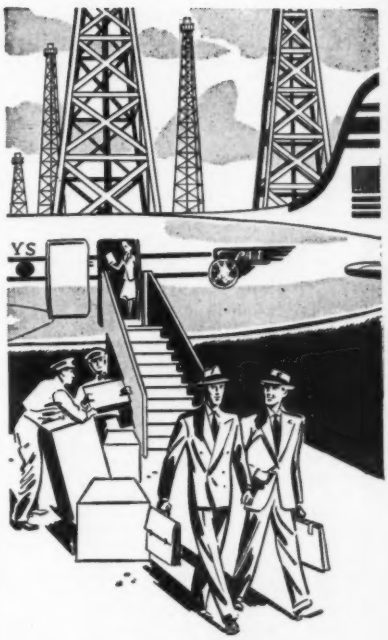
An additional and somewhat shallower pay zone, the Oswego lime, for the Ringwood pool, Major County, has been opened for production with the recompletion by Mazda Oil Corp. of its 1 Black, NE NW NW 12-21n-10w, at the southeast edge of the pool. The well originally was completed last December producing initially about 40 bbl. of oil daily from the pool's Manning zone with casing perforations at 6,804-86 ft. With production down to less than 5 bbl. per day from that zone, operators went back into the hole and opened the Oswego lime, perforating casing at 6,360-75 ft. and 6,435-55 ft. Producing from both zones, the well flowed initially 54 bbl. of oil per day through ½-in. choke. The pool now has three pay zones, the Manning, Maramack, and Oswego.

OKLAHOMA SUCCESSFUL WILDCATS

Kay County: Extension to Banner dist.—Wood Oil 1 Buckles, SE SE SW 6-27n-2e, flowed 38 bbl. 39.7°-gravity oil per day from Bartlesville at 3,542-90 ft., TD 4,106 ft., old dry hole drilled deeper from 3,727 ft., Mississippi lime 3,725 ft., Woodford 4,075 ft., Wilcox 4,099 ft.

Lincoln County: Anderson-Prichard 1 Bartodej, NW SW SE 32-12n-5e, est. elev. 1,075 ft., pumped 118 bbl. of 42°-gravity oil per day from second Wilcox at 5,020-55 ft., TD; Avant 1,970 ft., Hogshooter 2,540 ft., Checkerboard 2,900 ft., Oswego 3,767 ft., Prue 3,796 ft., Skinner 2,860 ft., lime 4,060 ft., no Red Fork, Inola 4,160 ft., lime 4,278 ft., basal Pennsylvanian - Caney 4,395 ft., Mayes 4,535 ft., Woodford 4,685 ft., Hunton 4,751 ft., Sylvan 4,796 ft., Viola 4,900 ft., dolomite 4,935 ft., Wilcox 4,964 ft.

Love County: Walter Fant 1 Reid, SW SW SW 2-7s-2e, elev. 754 ft., DF, flowed 103 bbl. 42.8°-gravity oil per day from sand at 6,024-60 ft., TD 6,248 ft., Hoxbar un-



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conformity 1,855 ft., sand 4,673 ft., fine sand 5,247 ft., sand 5,931 ft.

Major County: Extension to Ringwood, Mazda 1 Black, NE NW NW 12-21n-10w, elev. 1,276 ft., flowed 50 bbl. oil per day from Oswego at 6,315-25 ft. and 6,435-50 ft., TD 7,206 ft., old well drilled deeper from 6,945 ft., Mississippi lime 7,136 ft.

McClain County: Extension to No. Lindsay, Cities Service et al 1 Jones "C," C NW NE 32-5n-4w, elev. 1,113 ft. DF, flowed 218 bbl. 41°-gravity oil per day from Chimney Hill at 10,250-68 ft., TD 12,510 ft., basal Pontotoc 4,908 ft., Kansas City-Lansing 6,358 ft., Springer 8,530 ft., Mayes 9,560 ft., Woodford 9,700 ft., Bois d'Arc-Hunton 9,900 ft., Haragan-Hunton 9,990 ft., Sylvan 10,290 ft., Viola 10,500 ft., bromide dense 10,990 ft., first bromide sand 11,100 ft., second bromide sand 11,280 ft., basal bromide 11,436 ft., Oil Creek 11,853 ft., Oil Creek sand 12,123 ft., Joins 12,220 ft., Arbuckle 12,286 ft.

OKLAHOMA WILDCAT FAILURES

Alfalfa County: Deck and Olson Drilling 1 Morris, NW NW SW 27-25n-9w, elev. 1,247 ft., dry, TD 6,789 ft., Layton 5,006 ft., Oswego 5,387 ft., Big lime 5,417 ft., Mississippi lime 5,860 ft., Woodford 6,390 ft., Hunton 6,455 ft., Sylvan 6,500 ft., Viola 6,590 ft., Wilcox 6,640 ft., second Wilcox 6,692 ft.

Cotton County: Bridwell 1 Holcomb, SE NE SE 35-1s-11w, elev. 997 ft., dry, TD 2,620 ft., Megargel lime 2,485 ft.

Hughes County: Ideal Cement Co. 1 Ross, NE NE NE 31-6n-11e, geological test No. Hilltop area, elev. 769 ft., dry, TD 5,187 ft., Wapanucks 4,500 ft., Union Valley 4,818 ft., Cromwell 4,818 ft., Cromwell 4,868 ft., Caney 5,185 ft.

Kiowa County: Mercer & Huffine 2 Kuntz, SE SW NW 21-6n-17w, dry, TD 600 ft., sand 458 ft. and 526 ft.

Logan County: Aurora Gasoline and Harper-Turner 1 Sartain, C NE NW 19-15n-2w, 1½ mi. W Pleasant Valley, elev. 1,038 ft., dry, TD 6,244 ft., Pawhuska 2,655 ft., Deer Creek 2,835 ft., LeCompton 3,007 ft., Oread 3,540 ft., Checkerboard 5,010 ft., Oswego 5,435 ft., Verdigris 5,597 ft., lower Skinner 5,675 ft., Woodford 5,706 ft., Hunton 5,775 ft., Sylvan 5,799 ft., Viola 5,896 ft., Wilcox 6,040 ft., second Wilcox 6,222 ft.

Pawnee County: Barrett & Musgrave 1 Hogan, NE SE NW 31-20n-8e, dry, TD 2,615 ft., Big lime 2,188 ft., Oswego 2,230 ft., Prue 2,308 ft., Verdigris 2,322 ft., Skinner 2,375 ft., lime 2,520 ft., Red Fork 2,568 ft., Inola 2,642 ft., Bartlesville 2,700 ft.

Payne County: Crites and Taylor 1 Storms, SE SE NW 10-17n-5e, elev. 892 ft., dry, TD 3,675 ft., Hogshooter 2,226 ft., Checkerboard 2,542 ft., Big lime 3,050 ft., Oswego 3,084 ft., Prue 3,168 ft., Verdigris 3,317 ft., lime 3,428 ft., Red Fork 3,495 ft., Inola 3,576 ft., coal 3,585 ft., Bartlesville 3,600 ft.

Harper-Turner and Marten 1 Cundiff, SE SE NW 35-18n-2e, elev. 933 ft., dry, TD 4,487 ft., Checkerboard 3,556 ft., Oswego 3,990 ft., Verdigris 4,102 ft., Skinner 4,202 ft., lime 4,230 ft., Red Fork 4,258 ft., Bartlesville 4,310 ft., Mississippi lime 4,434 ft.

McMahon, Inc. 1 Wolff, NW NE NE 15-19n-3e, elev. 949 ft., dry, TD 3,931 ft., Dewey 2,590 ft., Osage-Layton 2,672 ft., Cushing1Layton 2,978 ft., Checkerboard 3,280 ft., conglomerate 3,315 ft., Peru 3,423 ft., Big lime 3,499 ft., Oswego 3,631 ft., Prue 3,730 ft., Verdigris 3,759 ft., Skinner 3,765 ft., lime 3,888 ft., Red Fork 3,902 ft.

Wilcox 1 Focht, NE SW NW 20-9n-3e, elev. 874 ft., dry, TD 4,472 ft., Layton 3,050 ft., Checkerboard 3,328 ft., conglomerate 3,480 ft., Big lime 3,554 ft., Oswego 3,681 ft., Verdigris 3,803 ft., Skinner 3,783 ft., lower Skinner 3,900 ft., lime 3,927 ft., Red Fork 3,950 ft., Mississippi lime 4,162 ft., Woodford 4,282 ft., Sylvan 4,335 ft., Viola 4,365 ft., Wilcox 4,430 ft., second Wilcox 4,438 ft.

Rocky Mountain

Successes Pace Activity Throughout Rocky Region

DENVER.—Shell Oil Co. has found oil in two formations at its North Sterling, Colorado, wildcat and is running casing on the well. The company's 1 Green, SW NW NW 30-9n-53w, topped Muddy at 4,869 ft. On drill-stem test at 4,871-97 ft. with tool open 2 hours there was a gas blow in 8 minutes with an oil spray at the end of that period. As pipe was pulled the well unloaded, leaving only 370 ft. of fresh water in the drill stem. Shell cored and drilled ahead to 5,060 ft., total depth, in Dakota and on test in that zone found 25 ft. of green oil. The operator will continue tests on the wildcat. This well is in the area where British-American Oil Producing Co. recently suspended operations at its 1 Green, NW NE SE 20-9n-53w, after the well flowed 10 bbl. of oil daily with some water from "D" sand, equivalent to the so-called Muddy zone. British-American plans to treat its wildcat with Hydrafrac in the near future.

Activity is continuing through the Denver-Julesburg Basin of northeastern Colorado and southwestern Nebraska. During the week gas discoveries were completed by Macauley-Dorough and by Ohio Oil Co. in Cheyenne County, Nebraska. (For details see wildcat completion paragraphs below).

A new pay completion of interest in the Big Horn Basin of Wyoming is Phillips Petroleum Co.-Pioneer Oil Corp.'s Phosphoria completion at Golden Eagle. Last year Phillips, on a farm-out arrangement with Pioneer, made a Tensleep discovery in this field and this well also tested oil from Phosphoria with that formation cased off for completion. The team's 2 Golden Eagle, NW NE SW 12-45n-97w, following a 14,000-gal. acid treatment in Phosphoria, flowed 1,115 bbl. of oil in 24 hours. The well was drilled into Tensleep and plugged back for completion in Phosphoria.

Farmers Union Central Exchange is now swabbing and testing its discovery at Northwest Sumatra, Rosebud County, Montana, with the well now making approximately 28 bbl. of oil per hour. Production is from Heath portion of Big Sandy group and represents a new zone for the central Montana area. The well is 1 Sawyer, C NE SW 26-11n-32e, and the productive zone is 5,255-77 ft. The discovery is of particular interest because of the absence of Heath in Texas Co.'s wildcat at 1 State, C SE NW 36-11n-33e, 6 miles east of the Farmers Union wildcat.

Tide Water Associated Oil Co. has made location for a Tensleep test in the Bates Park area, Natrona County, Wyoming, at 8-3-G, SW SW SW 3-30n-81w. Nix & Harris of Oklahoma City moved in for a wildcat at 1 Schaffer, C NW SW 22-8n-55w, in the Willard area, Logan County, Colorado. In continuing its Madison program in the general Pondera area, General Petroleum Corp. moved in cable tools at 6-18-P, SW NW SW 18-27n-3w, in the Martin area, Pondera County, Montana. Ohio Oil Co. and R. A. Goodall of Ogallalla, Neb., spudded a wildcat east of previous current Denver-Julesburg Basin tests at 1 Kahl, NW NW NE 1-13n-41w, in the Brule area, Keith County, Nebraska.

WYOMING SUCCESSFUL WILDCAT

Washakie County, Slick Creek: General Petroleum Corp. 84-32-G, SE SE NE 32-47n-92w, TD 10,554 ft., flowed 684 bbl. oil per day, ⅜-in. bean, Cody 4,550 ft., Frontier 7,295 ft., first Frontier 7,595 ft., second Frontier 7,714 ft., third Frontier 7,860 ft., Muddy 8,550 ft., Dakota 8,750 ft., Jurassic sand 9,150 ft., Curtis 9,670 ft., Dinwoody 10,414 ft., Embar 10,560 ft.

WYOMING WILDCAT FAILURES

Niobrara County, Ant Hills: Wytex Oil Co. 3 Govt., SE SW NW 1-37n-63w, TD 6,953

ft., dry, Dakota 4,857 ft., Fuson 4,957 ft., Lakota 4,995 ft., Morrison 5,069 ft., red beds 5,582 ft., Sundance 5,678 ft., Converse 6,243 ft., first Leo 6,778 ft., second Leo 6,899 ft.

Shawnee area: J. M. Huber Corp. 1 State, C NW SE 36-34n-67w, TD 8,500 ft., dry, Fox Hills 3,093 ft., Pierre 3,483 ft., Niobrara 7,711 ft., Frontier 8,224 ft.

COLORADO WILDCAT FAILURES

Moffat County, Skull Creek: Tri-State Oil Co. and Oklahoma Oil Co. 1-A Goff, SW NW SE 2-3n-100w, TD 1,615 ft., dry, Dakota 947 ft., Morrison 1,035 ft.

Park County, Hartzel: Wycomo Oil 1 State, SW NW SE 16-11s-75w, TD 5,485 ft., dry, Pierre 50 ft., Niobrara 4,425 ft.

UTAH WILDCAT FAILURE

Millard County: Black Rock: El Capitan Drilling Co. 1 fee, C NE NE 29-25s-10w, TD 3,379 ft., dry.

WESTERN NEBRASKA SUCCESSFUL WILDCATS

Cheyenne County, Southwest Sidney area: Macauley-Dorough 1 Anderson, SE SE SE 12-13n-51w, TD 5,288 ft., perf. 4,660-72 ft., 3 holes per ft., flowed 4,500,000 cu. ft. gas daily, 27/64-in. choke, TP 820 psi., CP 960 psi., 5½-in. csg. 4,727 ft., Niobrara 3,868 ft., Ft. Hayes 4,160 ft., Codell 4,242 ft., Greenhorn 4,403 ft., "D" sand 4,660 ft., "J" sand 4,800 ft., "M" sand 5,012 ft., "O" sand 5,066 ft., "T" sand 5,185 ft., Morrison 5,255 ft.

Sunol area: Ohio Oil Co. 1 Fender, NW NW SW 2-14n-48w, TD 6,814 ft., perf. 4,350-60 ft. 30 holes, flowed 4,700,000 cu. ft. gas daily, 5½-in. csg. 4,395 ft., Niobrara 3,581 ft., Ft. Hayes 3,846 ft., Codell 3,945 ft., Greenhorn 4,115 ft., first Dakota 4,349 ft., second Dakota 4,449 ft., third Dakota 4,487 ft., Cloverly 4,710 ft., Morrison 4,923 ft., Cimmaron 5,102 ft., Stone Corral 5,600 ft., Big Blue 5,657 ft., Shawnee 6,095 ft., Kansas City 6,220 ft., Cherokee 6,670 ft., granite wash 6,768 ft., granite 6,792 ft.

WESTERN NEBRASKA WILDCAT FAILURE

Cheyenne County, North Lodgepole: Texas Co. 1 Miller, C SW NW 13-15n-47w, TD 4,690 ft., dry, Niobrara 3,310 ft., Greenhorn 3,840 ft., "D" sand 4,080 ft., "J" sand 4,196 ft., Cheyenne 4,437 ft., Morrison 4,683 ft.

Appalachian Field

Stepout to Discovery Staked in Maryland

PITTSBURGH.—In Garrett County, Maryland, operations have been started by Eberly & Snee at 1 E. O. Donald, located approximately 0.8 mile north of the Welch well recently completed with a large flow of gas. Columbian Carbon Co. 1 Oren T. Graser is drilling at 175 ft. These wells are on the Oakland Quadrangle.

West Virginia.—In the Limestone Hill area, Tucker district, Wirt County, Godfrey L. Cabot, Inc. 1-1328 W. T. Grant Tract, elevation 763 ft., resulted in a dry hole at 5,255 ft. In Tolcott district, Summers County, this operator's 1-1330 S. H. Pence, wildcat, elevation 1,798 ft., is drilling at 1,720 ft.

Pennsylvania.—In Leidy Township, Clinton County, north central part of the state, two new locations have been made: C. E. Fralich et al 1 State Lands, Tract No. 2, and Pittsburgh Oil & Development Co.-David Simons 1 Clyde Brooks. Both locations are on the Hammersley Fork Quadrangle.

In the southwestern part of the state, Unity Township, Westmoreland County, Peoples Natural Gas Co. 1-3921 Fred Musnug, elevation 2,100 ft., is drilling at 7,230 ft. In Napier Township, Bedford County, South Penn et al-Snee & Eberly 1 Jesse B. Miller, elevation 1,666 ft., is drilling at 7,840 ft.

WEST VIRGINIA WILDCAT FAILURE

Wirt County, Tucker district: Godfrey L. Cabot, Inc. 1-1328 fee (W. T. Gant Tract), elev. 763 ft., dry, Corniferous lime 4,998 ft., Oriskany sand 5,202 ft., TD 5,255 ft.

California

SE Cuyama Valley Test Proves Dry

LOS ANGELES.—One more deep test has been unsuccessful in the highly faulted, complicated area on the southeastern end of Cuyama Valley. The latest dry wildcat, Oceanic Oil Co. 1 Oceanic-Shell in Section 19-9n-25w, topped Cretaceous at 3,173 ft. and was still in that formation at the total depth of 7,647 ft.

Located about 8 miles southeast of South Cuyama production, Honolulu Oil Co. had drilled to 7,009 ft. before dropping the venture. Oceanic and Shell Oil Co. took over and drilled the additional footage in the test. Drilled from an elevation of about 3,300 ft.; other formation tops included Monterey at 1,205 ft., Painted Rock at about 1,800 ft., and Colgrove at 2,255 ft.

Elsewhere in California, wildcatting activities were having no better luck. One wildcat in northern Los Angeles County which showed excellent prospects of being a new oil discovery was called a failure last week. This was the Los Nietos Co. 1 Edwards in Section 1-2n-16w, or in the Aliso sector of San Fernando Valley. From a plugged-back depth of 3,980 ft., on pumping tests during the past 2 weeks it had yielded as much as about 30 bbl. daily of 25°-gravity crude with about equal volumes of water.

In the same county, and in the Sylmar area, Section 21-3n-15w, Sunray Oil Corp. found its 1 Stetson-Sombrero disappointing at 12,027 ft. Hole previously had been carried to 8,250 ft. by Doheny-Battson-Lytle with no shows. In the South Mountain area of Ventura County, Shell failed at its 1 Ben Schieferle at 7,985 ft., and in Kern County's Belgian Anticline area Pacific Western Oil Co. called its 2-32 MM-TWA dry at 6,321 ft. after reportedly finding no oil shows.

In Dunnigan Hills field of Yolo County, Standard of California staked its 2 Bemmerly unit in Section 27-11n-1w as a southern extension test. In the Stern Corral area of Kern County, Shell was preparing to get under way with a wildcat in NE 26-28s-19e. Designated the 1 Security, it is about 4 miles southeast of Bacon Hills field. About ½ mile north of Pyramid Hills production in Kings County, General Production Co. has staked location for its 4 "Well" in SW 8-24s-18e.

In the Basin area, Orange County, Kennedy Co. has staked location for a wildcat between Richfield and Santa Ana Canyon fields. Called the 1 Vejar, it will be drilled in SE 26-3s-9w. In the Loma Verde region of Los Angeles County, Superior Oil Co. will drill its 51-28 Romero in Section 28-5n-17w, about 2 miles northeast of Oak Canyon production.

CALIFORNIA WILDCAT FAILURES

Kern County, Belgian Anticline area: Pacific Western Oil Corp. 2-32 M.M.-T.W.A., 32-30s-22e, dry, TD 6,321 ft., elev. 1,530 ft.

Bower Bank area: Rio Hondo Oil Co. 3 Bertha Cohn, 15-29s-24e, dry, TD 4,585 ft., elev. 291 ft.

Round Mountain area: Stansbury, Inc. 1 White, 33-28s-29e, dry, Vedder 2,520 ft., TD 2,650 ft., elev. 721 ft.

Los Angeles County, Sand Canyon area: Anne Arnold 1 Hanson, 36-4n-15w, dry, TD 2,840 ft., elev. 1,800 ft.

San Fernando-Aliso area: Los Neitos Co. 1 Edwards, 1-2n-16w, dry, TD 5,722 ft., elev. unknown.

Santa Barbara County, Cuyama Valley area: Oceanic Oil Co. 1 Oceanic-Shell

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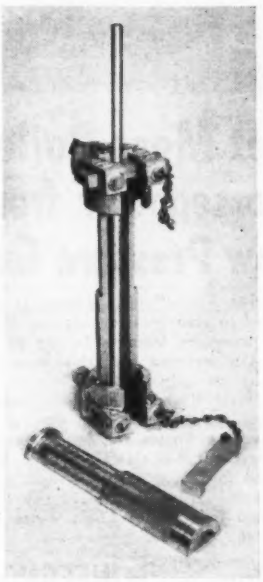
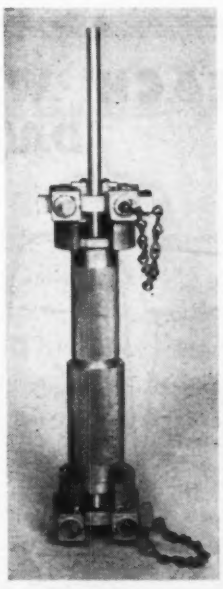


This new rod wrench is designed for rugged use with air tubing power tongs on sucker rod operations. First view shows wrench stripped ready to attach to rod. Wrench attached by tightening jaws at top and bottom adding front half of barrel section to form full circle around rod. Barrel section diameter—2½" and 2" tubing.



Second view shows wrench completely assembled. Outer surface of barrel section made of rough composition allowing firm grip with power tongs. Write Baird Manufacturing, Box 380, Tulsa, for complete details.

Baird Mfg. Co.

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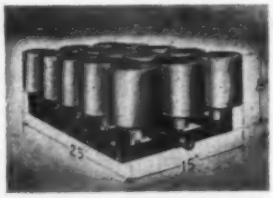

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(was Honolulu Oil Co. 1 Honolulu-Oceanic), 19-9n-25w, dry, Monterey 1,205 ft., Painted Rock 1,800 ft., Colgrove 2,255 ft., Cuyama Cretaceous 3,173 ft., TD 7,647 ft., elev. 3,403 ft.

Ventura County, South Mountain area:: Shell Oil Co. 1 Ben Schieferle, 16-3n-20w, dry, TD 7,985 ft., elev. unknown.

ARIZONA WILDCAT FAILURE

Apache County, Navajo Indian Reservation: Amerada Petroleum Corp. and Stanolind Oil & Gas Co. 1 Black Mountain, 13 mi. NE Chinle, 26-23n-28e, dry, TD 5,766 ft., elev. unknown.

Eastern Texas

Grayson County Venture Has Oil Creek Prospects

DALLAS.—A new pool or 2-mile southeast extension to East Sandusky field of northwestern Grayson County was apparent at Ada Oil Co. 1 S. T. Barnes, E. L. Stickney Survey. The new prospect, just ½ mile east of the town of Sandusky, ran a 28-minute drill-stem test from 7,143-57 ft. in the Oil Creek sand of the Simpson. The 1,000-ft. water blanket flowed in 13 minutes, oil and water blanket flowed in 19 minutes and clean oil in 23 minutes. It was allowed to flow for 5 minutes, making an estimated 10 bbl. on hour.

Recovery in the pipe was 3,100 ft. of clean oil. Bottom-hole pressure registered 3,100 psi. in 20 minutes. Operators then drilled additional sand with oil shows from 7,157-67 ft. and were running a second drill-stem test. Discovery well of East Sandusky field was L. O. Millan 1 Chambers, which completed in July for 396 bbl. of oil a day from the Oil Creek sand from 7,187-89 ft.

In Anderson County, 2 miles northeast of Tennessee Colony field, The Texas Co. 1 M. T. Holmes, wildcat test, recovered approximately 5,000 ft. of 45°-gravity oil, cut with mud and gas, on a 30-minute drill-stem test in the Pettit limestone from 9,585-9,622 ft. Additional oil unloaded while drill pipe was being pulled. Operators deepened to 9,665 ft. by coring.

A 1-mile northwest extension to Woodlawn gas-distillate area of Harrison County was in prospect at Hollandsworth Oil Co. 1 Frank Davis. First core from 6,495-6,530 ft. had no shows, but a second from 6,540-65 ft. had porous lime with gas and distillate shows in the top 20 ft. Operators said the well was about 7 ft. into the porous section when the core was taken, giving it a possible total porous section of 27 ft.

EAST TEXAS (DISTRICTS 5, 6 AND 6-P) WILDCAT FAILURES

Denton County: W. H. Hunt 1 H. E. Long, W. P. Johnston Sur., A-680, 5½ mi. NF Bolivar, dry, TD 1,950 ft.

Titus County: Phillips & Stephens 1 Anshults, M. Cartwright Sur., A-106, 10 mi. E Talco, dry, TD 5,517 ft., elev. 320 ft., Austin 3,180-3,245 ft., Woodbine 3,460 ft., Lower Cretaceous 3,395 ft., Goodland 4,360 ft., Paluxy 4,410 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURE

Donley County: G. B. Cree 1 Roberson, SW SW 23-C3-GC&SF, 10 mi. N Clarendon, dry, TD 3,716 ft., elev. 2,950 ft., dolomite 3,210 ft.

Canadian Fields

Large Natural Gas Strike Made in Bashaw Area

CALGARY. — A natural-gas strike with shows of some crude oil was made at a wildcat in the Bashaw area of central Alberta this week. The well, Transcontinental-Westlock 1, in LSD 13, 33-41-22w4, made the discovery in D3 Devonian coral reef. Location is about 110 miles north-northeast of Calgary and 22 miles south-southwest of the recently discovered D2-D3 Devonian pool near Camrose.

The well topped D3 zone at 5,716 ft., after going through tight unproductive higher formations. Initial drill-stem test, run from 5,717-22 ft., gave natural gas at an estimated rate of 5,000,000 cu. ft. daily. Second test, from 5,722-42 ft., brought gas to the surface in 2 minutes, spray of mud in 7 minutes, and a fine spray of light crude oil in 8 minutes. Maximum gas flow rate was measured at slightly over 12,000,000 cu. ft. daily. When pipe was pulled it was found to contain 180 ft. of light crude oil (39.3° gravity), plus 30 ft. of water. It has not as yet been determined whether the water source is from the formation or drilling fluid.

No further coring and testing has yet been carried out at the Bashaw wildcat, because a blowout preventer was installed today as a precaution against the large gas volume present in D3 Devonian zone. It is expected that coring and testing will be resumed in efforts to determine content of D3 zone below its present depth.

Central Leduc Oils, Ltd., and Del Rio Oil Producers, Ltd., Calgary independents, have commenced swabbing at their Acheson 1 well after perforating near top of Lower Cretaceous sand. This assured Lower Cretaceous oil success, in LSD 4, 13-53-26w4, failed to find Devonian production and was carried down to 5,500 ft. for further geological information. Hole was plugged back and production string of casing was set in the Cretaceous. During test in the Cretaceous prior to heading in search of Devonian objectives, the well flowed oil to the surface in 40 minutes, at an estimated influx rate of 84 bbl. an hour flush.

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oil operators, is moving in rotary tools for its second exploratory drilling venture in Alberta. The new venture is located on farmout lands from Canadian Gulf Oil Co. in the Red Deer Lake area of central Alberta, about 11½ miles southwest of the recent Socony-Vacuum Camrose dual-zone Devonian oil discovery. The team's new wildcat is Waterglen 1, in LSD 1, 28-43-22w4, about 19 miles southeast of Wetaskiwin and 9½ miles southwest of their initial wildcat failure. The Waterglen well will be a test down to and including the D3 Devonian equivalent, with probable completion depth around 5,500 ft.

CANADIAN SUCCESSFUL WILDCAT

Eldon 1, LSD 6, 21-57-25w4, TD 4,325 ft., capped as potential gas well.

CANADIAN WILDCAT FAILURE

Redwater Picadilly-Stony Plain 1, LSD 2, 3-52-26w4, TD 5,501 ft.

EASTERN CANADA

Gaspe.—On the Gaspe Peninsula, Quebec Province, Gaspe Oil Ventures, Ltd., of Montreal has located four new shallow tests, encircling its Continental-Gaspe 1 discovery well on the Galt Brook Dome. The discovery early this year developed a fair production of green light crude after acidizing at 928-33 ft. The new wells, Continental-Gaspe 2, 3, 4, and 5, are, respectively, north, west, southwest, and southeast of the discovery, and form part of the systematic 18-well development program launched by the company. The work will likely be handled by one drilling contractor, operating from a central camp.

In another Gaspe area, road has been completed and camp erected for Tar Point Anticline 1. Rigging will start almost immediately and test is expected to spud by the end of November.

Southwest Texas

Shallow Producer Opens Javali Pool

CORPUS CHRISTI.—Potential gage has made on Ben D. Marks, Trustee, 1 Downs Royalty Corp., new oil discovery approximately 4 miles west of Guerra field in Starr County. The producer was completed through open hole from 2,125-30 ft. for 11 bbl. of 33.8°-gravity oil per day on pump. Pay was topped at 2,124 ft. and 7-in. pipe set to 2,125 ft. for completion. The strike, located in Block 32, Beer & Coffey Subdivision, El Javali Grant, Abstract 77, has been named Javali.

In the confirmation test to the Javali discovery, the operator has run a drill-stem test from 2,121-30 ft., using ¼-in. and ⅜-in. chokes, and recovered 300 ft. of pipeline oil in 25 minutes. Operator is currently testing the well.

Anderson-Prichard Oil Corp. has completed its 1 Albin C. Jacobson, in Michael Green Survey, 1½ miles east of Elroy in Travis County, for a small oil discovery. The well was first drilled as a core hole and it was later decided to make production tests. During first series of tests, the well pumped 26 bbl. of oil per day from open hole at 814-36 ft.

A new rank wildcat is under way in Real County at John I. Moore and Dan Auld 1 Claude Haby, Section 111, City of San Antonio, Alazan Ditch Survey, approximately 12 miles southeast of Leaky. Keen interest is expected to develop in this well since there is relatively no sub-surface control in the area.

Sunray Oil Corp. is drilling ahead at 9,500 ft. in 1 J. O. Walker, Webb County wildcat 10 miles northeast of Oilton. Electric log was run to 9,005 ft. and operator cored from 9,279-9,425 ft., recovering sandy shale with no shows.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Bastrop County: Adams and Jackson 1 Duran, A. Flint Sur., 2 mi. SW Red Rock, TD 2,237 ft., perf. 2,164-82 ft., 13 bbl. 42°-gravity oil per day.

Jim Wells County: New pay at Seeligson—Magnolia Petroleum Co. 168 A. A. Seeligson, Los Jaboncillos-A. Ramirez Sur., TD 7,002 ft., perf. 6,809-13 ft., 144 bbl. 37.9°-gravity oil per day, 9/64-in. choke, TP 800 psi.

Starr County: Gen D. Marks, Tr. 1 Downs Royalty Corp., Block 42, Beer & Coffey Subd., El Javali Grant, A-77, TD 2,130 ft., open hole 2,125-30 ft., 111 bbl. 33.8°-gravity oil per day on pump.

Webb County: Seaboard Oil Co. of Delaware 1 Mary K. Withers, BS&F Sur. 40, Cert. 1,598, 25 mi. E Encinal, TD 6,725 ft., perf. 6,500-10 ft., 20 bbl. 61.5°-gravity condensate per day plus 21,600,000 cu. ft. of gas, SIP 2,892 psi.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Ryan, Hays & Burke 1 J. L. Tom, J. Benson Sur. 148, A-72, 2 mi. NW Weigang field, dry, TD 3,610 ft.

Bastrop County: Humble Oil & Refining Co. 1 Leon Kalina, Andrew Graham Sur. 12, 8 mi. SW Smithville, dry, TD 4,009 ft.

Burleson County: George Parker and Charles L. McCune 2 Marion W. Hohlt, J. Ybarbo Sur., A-260, 4½ mi. NW Clay, dry, TD 6,433 ft.

Caldwell County: Fred J. Adams 1 P. S. King, Sampson Connell Sur., 2¾ mi. W Lytton Springs, dry, TD 1,878 ft.

Duval County: George H. Coates 1 Octavio Saenz, Sweden Farm Lot 30, 6 mi. W Benavides, dry, TD 4,650 ft.

Humble Oil & Refining Co. A-65 V. Kohler, N. B. Gussett Sur. 400, 18 mi. SW Freer, dry, TD 3,975 ft.

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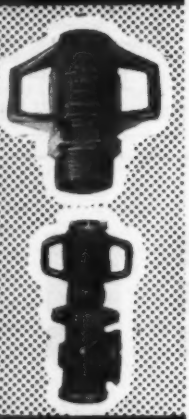
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WICHITA FALLS, TEXAS

Forest Oil Corp. 1 Ethel Wright, Samuel McCoy Sur. 76, A-340, 8 mi. S Waelder, dry, TD 5,204 ft.

Jim Hogg County: O. W. Killam 3 Moody Cotton Corp., Sur. 1,008, 4 mi. S Hebbronville, dry, TD 4,270 ft.

L. M. Lockhart 1 Mestena Oil & Gas Co., Jose Marcello Hinojosa Sur., 8 mi. E Hebbronville, dry, TD 6,503 ft.

Travis County: H. G. Goff 1 Jim Lockwood, Richard Duty Heirs Sur., 4 mi. S Littic, dry, TD 2,050 ft.

Webb County: Quintana Petroleum Corp. B-2 Duval County Ranch Co., Sec. 18, Duval County School Land, League 101, A-1,183, dry, TD 6,400 ft.

North Central Texas

Stanolind Well Tests Oil and Gas Shows

WICHITA FALLS.—In southern Knox County, Stanolind Oil & Gas Co. 1 Icelena Clonts, 5 miles northeast of Knox City, had shows of oil and gas in the Palo Pinto reef limestone. Top of the porous limestone was called at 4,175 ft., and a 90-minute drill-stem test from 4,175-92 ft. recovered 450 ft. of gas and 100 ft. of heavily oil and gas-cut mud. Bottom-hole pressure was 500 psi. in 30 minutes. Operators were to drill ahead 10 ft. and retest.

In southwestern Archer County, Rycade Oil Corp. finished its 1 Hayter, G. W. Stell Survey, northeast of Megargel, for a calculated potential of 534 bbl. of oil a day. The completion was based on an actual flow of 178.25 bbl. of oil in 8 hours, from the Mississippian at 5,058-85 ft. Nearest deep production is 4 miles to the southwest in Bishop Caddo field.

In southeastern Archer County, first attempt to confirm production in Barbara Caddo field failed at 5,297 ft. The test was L. T. Burns 1 Berend, Clark & Plumb Survey, and a north offset to the discovery.

Young County operations included Henry Grace Production Co. 1 W. L. Hawkins, semiwildcat northeast of Farmer, which at last report had 7-in. pipe at 3,706 ft. A drill-stem test in sand from 3,706-17 ft. recovered considerable gas in the pipe, along with 20 ft. of free oil and 65 ft. of heavily oil-cut mud.

R. J. Caraway and T. D. Humphrey 1 John Behringer, 1½ miles east of Old Glory field discovery in Stonewall County, completed from the Bend conglomerate for a daily potential of 126.7 bbl. of oil. The flow was through 16/64-in. choke.

In the same area, Skelly Oil Co.'s 2 Cleve Hamilton had pipe set at 5,874 ft. and was waiting on cement. The well unloaded oil on a drill-stem test of the Bend, topped at 5,876 ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Callahan County: Arthur N. Faustgen 1 L. F. Martin, 63-14-T&P, 20 mi. NW Baird, TD 1,618 ft., pay 1,609 ft., flowed 165 bbl. of 40°-gravity oil a day, 20/64-in. choke, GOR 1,266 cu. ft., CP 300 psi., TP 175 psi.

Arthur Faustgen 1 L. F. Martin "A," 63-14-T&P, 5 mi. E Hamby, TD 1,629 ft., pay 1,613 ft., pumped 31 bbl. of 41°-gravity oil a day.

Eastland County: W. E. Bradley 2 J. W. Courtney, 41-4-H&TC, 3½ mi. NW Eastland, TD 3,029 ft., PB 1,651 ft., perf. 1,641-51 ft., flowed 89 bbl. 38°-gravity oil a day, TP 60 psi., GOR 200 cu. ft.

Hardeman County: Cities Service Oil Co. 1 Certainteed Products Co., 145-H-W&NW, 3 mi. N Quanah, TD 8,116 ft., elev. 1,457 ft., Canyon lime 4,376 ft., Mississippian 7,865 ft., perf. 5,832-65 ft. in lower Canyon, flowed 13.54 bbl. of 39°-gravity oil a day, ½-in. choke, TP 185 psi.

Jones County: Woodley Petroleum Co. 1 T. H. Bumpass "A," Allen B. Jones Sur. 265, 5 mi. ENE Noodle, TD 4,735 ft., PB 2,912 ft., elev. 1,778 ft., Gunsight 2,824 ft., perf. 2,827-33 ft., flowed 63.6 bbl. 41°-gravity oil in 8 hr., 20/64-in. choke, TP 30 psi., GOR 471 cu. ft.

Stephens County: Jackson & Diller 1 J. S. Pierce, Sec. 2094, TE&L Sur., 7 mi. SE Breckenridge, TD 2,022 ft., gas sand 2,003 ft., 16,000,000 cu. ft. gas, open flow.

Taylor County: Drilling & Exploration Co., Inc. 1 J. H. Doan, 64-19-T&P, 1 mi. W Blair, TD 2,898 ft., Cook lime 2,873-98 ft., pumped 76.7 bbl. of 42°-gravity oil a day.

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NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Texas Co. 1 Cecil Mankins, Sec. 1, SPRR Sur., ¾ mi. E Mankins, dry, TD 1,852 ft.

Wm. H. McCluskey 1 J. J. Perkins, N. Anderson Ranch, Blk. 1, 9 mi. NE Megargel, dry, TD 1,515 ft., elev. 1,178 ft., Gunsight 1,461-73 ft.

H. J. Mummert, Jr. 1 Fannie M. Byrd, Blk. 14, L. M. Pasture Subd., W. E. Probert Sur., 2½ mi. NE Megargel, dry, TD 1,605 ft., Gunsight 1,428-35 ft.

Neeld & Hood Drilling Co. 1 T. L. Wolf, Lot 83, Blk. 4, Clark & Plumb Subd., 4 mi. SW Windshorst, dry, TD 3,518 ft.

Frank Wood 1 U. J. Veitenhamer, Lot 9, Blk. 4, Clark & Plumb, ¾ mi. NE Windthorst, dry, TD 2,000 ft.

Baylor County: J. J. Lynn 1 Claude Cowan "E," Sec. 209, T&NO, A-361, 12 mi. E Seymour, dry, TD 2,615 ft., reef 2,585 ft.

Brown County: D. C. Norwood and C. H. Kadane 1 Mollie Landreth, Jesse Dickinson Sur. 10, A-237, 4 mi. NE May, dry, TD 780 ft.

Callahan County: McElroy Ranch Co. 2 Emma Cottle, Sec. 2048, TE&L Sur., 8 mi. Putnam, dry, TD 623 ft.

Comanche County: Yeatman Drilling Co. 1 R. W. Fielder, Blk. 4, HT&B Sur., 3½ mi. NW Sidney, dry, TD 2,862 ft., elev. 1,485 ft., Marble Falls 2,298 ft., Barnett 2,804 ft., Ellenburger 2,818 ft.

Cooke County: Houston Bowers 1 E. F. Blakeley, J. McDonald Sur., A-765, 3 mi. SW Bulcher, dry, TD 2,441 ft.

O. J. Van Horn 1 Charles Cler, Henry Dixon Sur., A-335, 3½ mi. NW Muenster, dry, TD 2,661 ft.

Eastland County: William L. Dickson 1 J. H. Nix, W. H. Medearis Pre-Emption Sur., 7 mi. N Eastland, dry, TD 2,003 ft.

Hamilton County: Luling Oil & Gas Co. 1 Ernest Phillips, S. D. Sansom Sur., 11 mi. E Hamilton, dry, TD 4,413 ft., elev. 1,277 ft., Marble Falls 3,864 ft., Ellenburger 4,252 ft.

Jack County: Frank Wood & Bros., Inc. 1 E. C. Richards, J. H. Hensley Sur., A-301, 8 mi. SE Jacksboro, TD 4,710 ft., conglomerate 4,560-75 ft.

Jones County: C. R. Gilliland 1 Earl Wilson, James Bennett Sur., 7 mi. E Hawley, dry, TD 2,205 ft.

S. C. Herring Drilling Co. 1 W. O. Rainwater, 21-2-SPRR, 4 mi. SW Anson, dry, TD 3,286 ft., elev. 1,807 ft., Flippen 2,553 ft.

W. F. Nenney 1 D. L. Bristow, 340-14-Austin & Williams Sur., 4 mi. E Hamlin, dry, TD 3,303 ft., elev. 1,669 ft., Flippen 3,090 ft.

Sojourner Drilling Co. 2 W. R. Hudspeth, Blk. 22, E. Miley Sur., 5 mi. NW Noodle, dry, TD 4,856 ft., elev. 1,816 ft., Canyon sand 4,142-62 ft.

West Central Drilling Co. 1 Milsap, Harrison CSL, 10 mi. W Anson, dry, TD 3,374 ft., Flippen 2,842 ft., King sand 3,275 ft., Swastika 3,326 ft.

Knox County: Sinclair Oil & Gas Co. 1 John Jones, 110-C-H&TC, 5 mi. NE Benjamin, dry, TD 6,305 ft., Canyon 3,617 ft., Caddo 5,684 ft., Mississippian 5,917 ft., Ellenburger 6,275 ft.

Parker County: T. W. Doswell 1 W. H. Jones, S. Coody Sur., A-243, 15 mi. SW Weatherford, dry, TD 2,600 ft., elev. 546 ft., lime 1,520 ft.

Throckmorton County: Emanon Drilling Co. 2 J. S. Gilbert, Sec. 926, TE&L Sur., 6 mi. SE Throckmorton, dry, TD 1,601 ft.

Wichita County: National Associated Petroleum Co. 1 Edward Reilly, Thomas Curry Sur., A-345, 5 mi. NW Wichita Falls, dry, TD 5,880 ft., Strawn 4,254 ft., Bend 5,247 ft.

Palmer Drilling Co. 2 Waggoner, GC&SF Sur. 1, A-528, 6 mi. N Kamay, dry, TD 655 ft.

Palmer Drilling Co. 1 J. & J. Waggoner "A," GC&SF Sur., 6 mi. N Kamay, dry, TD 1,990 ft.

Young County: LeBus & Sinex Drilling Co. 1 H. C. Wells, TE&L Sur., A-739, 3½ mi. SW New Castle, dry, TD 2,578 ft.

J. B. Palmer 1 A. H. Taylor, TE&L Sur. 1673, A-960, 2½ mi. SW Murray, dry, TD 3,714 ft., Caddo 3,642 ft.

Michigan

Second Traverse Well Fails in Butman Field

MOUNT PLEASANT.—First offset to the Traverse oil discovery well in Butman field, Gladwin County, failed to show commercially after acid treatment. The venture was Robert Bond 2 Krivetsky, SE SE NW 12-20n-1w, just 660 ft. north of the first shallow Traverse producer in the field which was drilled by H. E. Bell. Bond logged Traverse at 2,784 ft. and hole was bottomed at 2,893 ft. The well had showed 350 ft. of free oil, natural.

New sections of the Richfield zone at Ohio Oil Co. 1 State-Custer, NW SW NW 16-29n-7w, Custer Township, Antrim County, had been perforated and were scheduled to be acidized. The portion which was scheduled for the current test was from 2,781-2,830 ft. which had been gun-perforated with 96 shots. Previously other Richfield zones, from 2,674-78 ft., 2,851-55 ft., and 2,839-45 ft. had been perforated, acidized, and tested with no favorable results. The wildcat showed about 2,000,000 cu. ft. of gas a day from Traverse on drill-stem test. Both Dundee and Monroe-Reed City zones were barren.

Deepening operations were started at Neil Wagenaar and Edward Wagner 1 Boy Scout-Marshall, SE SW SE 11-27n-6w, Excelsior Township wildcat, Kalkaska County. The well was completed as a Traverse oil discovery at 2,042 ft., total depth, and will be deepened to other known porosity zones in the same formations, from 60-100 ft. below Traverse top which was logged at 2,004 ft. The well was producing about 4 bbl. of oil a day before deepening was started. If Traverse lower zones fail, it

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will be plugged back to the upper pay and reacidized.

MICHIGAN WILDCAT FAILURES

Allegan County, Allegan Township: W. Spencer Cook, Inc., 1 Newton, NE NE NE 2-2n-13w, Traverse 1,517 ft., dry, TD 1,525 ft.

Antrim County, Mancelona Township: Empire Petroleum Co. 1 Michigan Trust Co., SW SW NW 29-29n-6w, Traverse 1,514 ft., dry, TD 1,577 ft.

Arenac County, Standish Township: W. T. McKenna 1 Kwotkowski, NE NE SE 1-18n-4e, Dundee 2,783 ft., dry, TD 3,010 ft.

Clinton County, Dallas Township: Mercer Oil Co., Inc. 1 Luttig, SE NE NW 9-7n-4w, Dundee 2,888 ft., dry, TD 2,921 ft.

Muskegon County, White River Township: Kenneth A. Fox 2 Gee, SW NW NW 14-12n-18w, Traverse 1,673 ft., dry, TD 1,690 ft.

Ohio Fields

Coshocton County Pool Continues Development

COLUMBUS.—A ½-mile extension to New Castle Township pool, Coshocton County, was brought in by Mid East Oil Co. on Evlyn Endsley in Section 23. Clinton sand was found at 3,153-94 ft. with a fair showing that made 40 bbl. in 24 hours after shot. The operator has moved north to the Neldon tract for an offset. Pure Oil 1 R. J. Daliere in the third quarter flowed 132 bbl. in 24 hours after shot. The sand was reported at 3,252-3,310 ft.

C. A. Davis et al. 2 John Burkholder, Section 3, Perry Township, Licking County, logged Clinton at 2,829-69 ft. with 7 bbl., natural. The well responded well to the shot and made 70 bbl. in 24 hours.

A Berea sand gas pool is being developed in the southwest part of Paint Township, Holmes County. The fourth completion, Phillips & Shields 1 Harry Miller, Lot 25, topped the sand at 964 ft. and finished at 5 ft. in with a natural gage of 800,000 cu. ft. There will be a production problem as there is water in the bottom of the sand.

OHIO WILDCAT FAILURES

Holmes County, Mechanic Township: Dave Shaffer 1 Earl Galley, Sec. 10, Clinton 3,653-3,740 ft., TD 3,742 ft.

Huron County, New London Township: Hanley & Bird 1 Homer Johnson, Lot 17, St. Peter 4,033-90 ft., TD 4,103 ft.

Texas Gulf Coast

Four New Discoveries Hightlight Week's Work

HOUSTON.—In the Tynan area of Bee County, Morris Cannan and Texita Oil Co. have completed their 1 P. C. Tom as a new oil discovery. The well gaged 35 bbl. of oil per day through ¼-in. choke. Production is through perforations at 4,188-95 ft. Tubing pressure during the test was 750 psi. and gravity of the crude 23°. Sand with shows was cored at 4,185-88 ft., 4,188-95 ft., and 4,195-96 ft. The new discovery is located in the H. H. Williams Survey, 4 miles west of Skidmore.

Arnold O. Morgan 1 F. J. Boehm, prospective gas-condensate discovery northeast of LaRosa field, Refugio County, is awaiting state potential test. A late gage on the wildcat through perforations at 6,303-06 ft. indicated a flow of 50 bbl. of condensate per day through 9/64-in. choke. Tubing pressure was 1,200 psi. and casing pressure 1,200 psi. Location is in the Esteban Lopez Survey, Section 13 of the J. and P. Subdivision of Bonnie View Ranch.

Shallow Frio pay has been opened at South Liberty field, Liberty County, at L. M. Josey, H. G. Nelms and M. T. Halbouty 2 E. P. Pickett, M. G. White Survey, Abstract 17. On a test through perforations at 3,900-20 ft., the well flowed at the rate of 175 bbl. of 25.6°-gravity oil per day through a 10/64-in. choke. Tubing pressure was 300 psi. The well was drilled to a total depth of 4,636 ft. in salt and 5½-in. casing was set at 4,117 ft.

On the west flank of Hull field, Liberty County, John W. Mecom 1 E. F. Failor, wildcat, flowed 266 bbl. of oil per day through perforations at 7,678-90 ft., indicating a new reservoir for this area. Test was made using a 3/16-in. choke. Tubing pressure was 1,000 psi. Operator is currently washing in the well. Location is in the W. S. Swilley Survey 183, Abstract 717.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Bee County: Morris Cannan and Texita Oil Co. 1 P. C. Tom, H. H. Williams Sur., A-403, TD 4,197 ft., open hole 4,188-95 ft., 35 bbl. 23°-gravity oil per day.

Brazoria County: New pay at Nash—Dan J. Harrison, Jr. 5 Belle Wisdom est., H. N. Cleveland Sur., A-166, TD 4,744 ft., perf. 4,418-39 ft., 85 bbl. 20.7°-gravity oil per day, 16/64-in. choke, TP 140 psi.

DeWitt County: New pool, "Helen Gohlke"—Shell Oil Co. 1 Gohlke heirs, T. J. Thigpen Sur., A-614, 7½ mi. NE Thomaston, TD 8,514 ft., perf. Wilcox 8,142-47 ft., 320 bbl. 32°-gravity oil per day, 16/64-in. choke, TP 675 psi., CP 1,425 psi.

Harris County: Texas Co. 1 Mrs. E. Hope Norris, I&GN RR Sur., A-1,448, 3 mi. SE Katy, TD 8,009 ft., perf. 7,576-86 ft., 7,000,000 cu. ft. gas per day, open flow, SIP 2,740 psi.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Brazoria County: Skelly Oil Co. 1, R. L. Jones, W. D. C. Hall League, A-69, 1½ mi. NE Bonney, dry, TD 8,015 ft.

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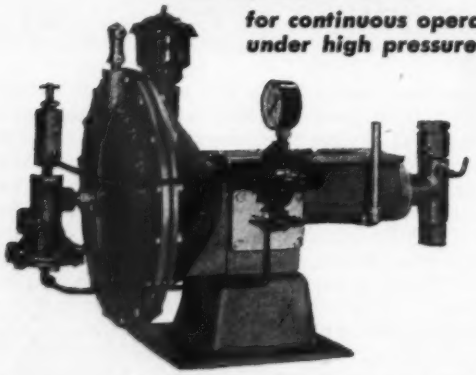

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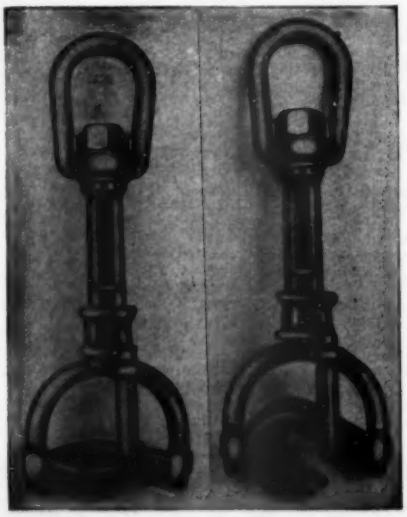

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Burleson County: George Parker and Charles L. McCune 2 Marion W. Hohlt, J. Ybarbo Sur., A-260, 4½ mi. NW Clay, dry, TD 6,433 ft.

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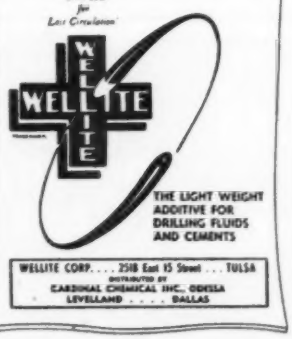

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Jackson County: C. G. Glasscock and Pontiac Refining Co. 1 "L" Ranch Co., James Morgan Sur., A-56, 4 mi. S Lolita field, dry, TD 8,604 ft.

Matagorda County: Brazos Oil & Gas Co. 1 State of Texas "W" (M-30071), State Tract 309, Matagorda Bay, 4 mi. S Palacios, dry, TD 5,803 ft.

Brazos Oil & Gas Co. 2 State "Q" (M-30064) State Tract 302, Matagorda Bay, dry, TD 5,751 ft.

Ohio Oil Co. A-1 B. W. Trull, Isaac Van Dorn Sur., A-400, dry, TD 10,010 ft.

Orange County: Magnolia Petroleum Co. 1 Oscar Chesson est., I&GN RR Sec. 5, A-115, 3 mi. N Terry, dry, TD 9,505 ft.

Victoria County: Refugio Drilling Co. et al 1 T. Davidson, Felix de Leon Sur., A-68, 8 mi. NW Victoria, dry, TD 4,110 ft.

Washington County: Newman Bros. Drilling Co. et al 1 Christ Kieke, Jas. F. Perry and Austin League, 14 mi. N Brenham, dry, TD 4,832 ft.

Louisiana-Arkansas

Lincoln Parish Gas Area Gets Deep Oil Discovery

SHREVEPORT.—C. H. Murphy et al., 1 Givens, 11-17n-4w, has given Simsboro gas pool of Lincoln Parish its first oil production. Topping Travis Peak at 6,415 ft., the well drilled on through several gas sands, and drill-stem tested at 6,892-6,912 ft. Using ¼-in. choke and 1,000-ft. water cushion, the test recovered 40 ft. of gas-cut mud and 30 ft. of 38.1°-gravity crude.

In Bienville Parish, a new pool received its first dry hole. A. E. Hall 1 Long-Bell, 4-15n-10w, topped Tuscaloosa at 2,743 ft., and quit at 2,854 ft. without testing Paluxy. The new producing area was discovered in September by E. C. Cook et al., 1 Locke, which found oil in Paluxy below 2,782 ft. Location of the pool is 4 miles south of Bistineau gas field.

Arkansas.—In Nevada County, Bodcaw field had one oil completion and prospects of another. Burnett Production Co. A-2 May was brought in for 42 bbl. daily, producing from perforations at 2,424-43 ft. Location is in Section 8-14s-22w. In the same section Carter Oil Co. 2 Daniels is swabbing perforations at 2,574-76 ft. Some 5 miles northeast of the field, J. K. Wadley 1 Butler, wildcat in 27-13s-22w, was found dry at 3,195 ft.

Spirit Lake field of Lafayette County got a good producer at E. D. Markham's 3 Velvin, 22-16s-25w. The well gaged 115 bbl. of 33°-gravity oil daily from 6-ft. of pay at 3,802 ft. Total depth is 3,890 ft.

NORTH LOUISIANA WILDCAT FAILURES

Concordia Parish: R. A. Campbell 1 Louis Fry, 2-8n-9e, dry, TD 6,220 ft., elev. 60 ft., Wilcox 3,455 ft.

Red River Parish: Zeke Lohman 1 Long Bell Lumber Co., 27-14n-9w, dry, TD 3,508 ft., elev. 193 ft., Nacatoch 1,217 ft., Tuscaloosa 2,930 ft., Lower Cretaceous 3,067 ft., Lower Paluxy 3,201 ft.

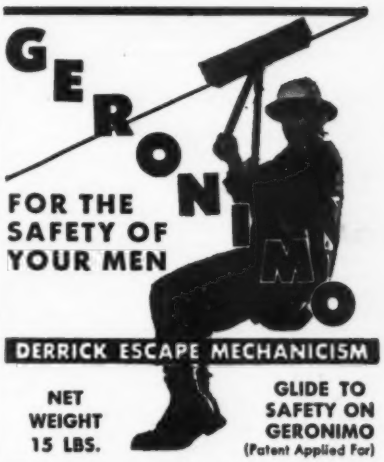
Richland Parish: Duerr & Bolin Co. 1 R. R. Rhymes, 5-15n-5e, dry, TD 3,558 ft., elev. 71 ft., Cane River 778 ft., Talahatta 920 ft., Wilcox 980 ft., Midway 1,983 ft., Monroe gas rock 2,497-2,536 ft., Eagleford 2,601 ft., Tuscaloosa 2,755 ft., Paluxy 3,443 ft.

Union Parish: Monla Gas Co. 1 fee, 13-23n-2e, dry, TD 3,008 ft., Wilcox 1,190 ft., Midway 1,560 ft., Arkadelphia 2,105 ft., Nacatoch 2,220 ft.

Youngblood & Stewart 1 Frost, 16-23n-1w, dry, TD 2,313 ft., elev. 164 ft., Nacatoch 1,165 ft.

ARKANSAS WILDCAT FAILURE

Union County: J. A. Rowland 1 fee, 6-17s-16w, dry, TD 3,489 ft., elev. 247 ft., Nacatoch 2,13 ft., Meakin 2,467 ft., by samples.



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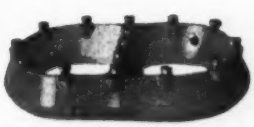

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Illinois-Ind.-Ky.

New Oil Pool Indicated In Sailor Springs Area

DISCOVERY of another pool for the Sailor Springs area of Clay County, Illinois, appears to have been made by George & Wrather Drilling Co. at its 1 Ditter, NE SE SE 18-4n-8e. The well, located ½ mile east of Sailor Springs and 2 miles from nearest production, got promising oil showings in McClosky lime and has run casing for completion.

Best appearing interval on drill-stem tests was at 2,990-98 ft. where 90 ft. of clean oil and 480 ft. of oil-cut mud was recovered with tester open 60 minutes. Other tests were made of intervals at 2,964-80 ft. and 2,980-90 ft. No water was evident.

Calvert Drilling, Inc., and associates 1 Madden, ½ mile from production in the area 2 miles north of Willow Grove, Jasper County, same state, swabbed 57 bbl. of oil in 15 hours in starting tests of Rosiclare lime at 2,456-64 ft. Pay zone had been given a 1,000-gal. acid treatment. Location is 330 ft. out of the northwest corner of 19-7n-11e.

Production of the Herald pool, White County, is being extended ¾ mile to the west in the area 4 miles northeast of Omaha where Miami Operating Co. is testing the McClosky lime and Benoist sand zones in its 1 Sutton, NE NW SE 8-7s-9e. Total depth is 3,072 ft. with McClosky at 3,062-72 ft and Benoist at 2,822-32 ft. Swabbing from the lower pay, on which casing had been cemented, the well made 103 bbl. of oil in the first 3 hours and then settled to around 9 bbl. per hour. Promising showings also were obtained in the Tar Springs sand, logged at 2,382-94 ft.

James N. Hockman and Calvert Drilling, Inc., have what looks like an exceptionally good well in their 1 Anderson, SE SE SE 2-6s-6e, 5 miles southeast of McLeansboro, Hamilton County, Illinois. The well, located ½ mile from nearest production in the Hoodville pool, is a prospective producer in both the Aux Vases at 3,037-47 ft., on top of which, at 3,034 ft., casing has been run, and the Benoist at 2,954-64 ft., opposite which an alloy section was run in the casing string. In a 60-minute drill-stem test of the lower pay, the well gassed within 4 minutes after the tester was opened and started flowing clean oil within 30 minutes. Indicated bottom-hole pressure was 970 psi. A 75-minute test of the Benoist sand got gas within 35 minutes and yielded 270 ft. of clean oil and 60 ft. of mud-cut oil when pipe was pulled. Bottom-hole pressure was 575 psi.

Iley Browning has found another productive spot in the Poole district, Webster County, western Kentucky. His 1 Crowley Heirs, 14-N-23, south of the town of Poole, had 105 ft. of clean oil and 55 ft. of oil-cut mud in the pipe following a 60-minute drill-stem test at 1,888-1,900 ft. in Tar Spring sand. Casing was cemented on top the zone, and with plug drilled out, production tests are being started.

The Iola South pool, 6 miles west of Louisville, Clay County, Illinois, has a ½-mile extension at Shulman Brothers 1 Gibson, NW SE NW 14-4n-5e, which swabbed at the rate of 1½ bbl. an hour in initial tests of the Benoist sand at 2,465-75 ft. Pay zone was shot with 20 qt.

ILLINOIS SUCCESSFUL WILDCAT

Fayette County: C. J. Simpson 1 Bonnell, NW NW NE 15-4n-1w, IP 12 bbl., Benoist 1,418-23 ft., TD 1,425 ft. (opens new pool).

ILLINOIS WILDCAT FAILURES

Clinton County: Ash Drilling Co. 1 Schuette, SW NE SE 26-3n-4w, dry, TD 1,182 ft.

Coles County: R. Shipman 1 Snoddy, SE SE NW 21-14n-14w, dry, TD 1,067 ft.

Edgar County: National Associated Petroleum Co. and Continental Oil Co. 1 Rhoads Community, SE SW NW 28-13n-11w, dry, TD 1,163 ft.

Gallatin County: G. L. Reasor 1 Jennings-Gratton, SE NW SE 24-9s-8e, dry, TD 2,582 ft.

Hamilton County: B. M. Heath 1 Gaither, SW SW NE 19-6s-5e, dry, TD 3,425 ft.

Madison County: Kruger Brothers 1 Prange, SE NW SE 6-6n-5w, dry, TD 650 ft.

Marion County: E. M. Self 1 Glasgow, NE SW NE 20-2n-3e, dry, TD 2,555 ft.

Richland County: Skiles Oil Corp. 1 Hixon, NE NW SE 22-3n-14w, dry, TD 3,194 ft.

St. Claire County: C. W. Young 4 Hotz et al, NE SW NW 29-3s-6w, dry, TD 540 ft.

White City: V. R. Gallagher 1 Keck Heirs, SE NE NE 31-6s-11e, dry, TD 3,014 ft.

INDIANA SUCCESSFUL WILDCAT

Posey County: Sam Garfield 1 Benson et al, NW SW NW 31-6s-13w, IP 12 bbl., Mansfield 1,468-76 ft., TD 1,480 ft.

INDIANA WILDCAT FAILURES

Marshall County: Lee-Hoffman et al 1 Sahldoff, SE NW SE 7-34n-3e, dry, TD 525 ft.

Posey County: Buchman-O'Neal 1 Hahn, NW NW SE 20-7s-14w, dry, TD 2,934 ft.

G. L. Reasor 1 Rosenbaum, NW NW NE 25-6s-13w, dry, TD 2,946 ft.

EASTERN KENTUCKY

ASHLAND.—In Fleming County, 20-V-70, walter Kline et al are still drilling in Knox dolomite, having reached a present depth of 1,600 ft. Some water has been encountered and operators intend to shut off same before drilling deeper. This rank wildcat is several miles south of the town of Hillsboro.

In Big Sandy gas field, United Fuel Gas

THE OIL AND GAS JOURNAL

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Foreign: D. T. O'Connor, 500 Fifth Avenue, New York, N. Y.; Petroleum Industry Consultants, C.A., Caracas, Venez.; Denton-Spencer Co., Ltd., Calgary, Alberta, Canada

Co. has completed 6581 Jonah Williamson on Callahan Branch in Pike County for 959,000 cu. ft. of gas daily from Maxon (Mississippian) sand at total depth of 2,150 ft. In the same field, Kentucky West Virginia Gas Co. has completed 948 Margaret Wireman in the Magoffin County sector for 134,000 cu. ft. of gas daily from Salt sand (Pennsylvanian) at a depth of 2,674 ft.

In Springfork pool of eastern Breathitt County, United Carbon Co. has a dry hole at the 1533 E. J. Evans fee on Laurel Fork. Test was drilled to the Big Six (Silurian) sand but failed to find commercial production to total depth of 2,639 ft.

Permian Basin

Three Counties Have Apparent Discoveries

MIDLAND. — Ellenburger production on the east side of the Permian Basin has taken a new and more important outlook, following completion of Star Oil Co.'s 1 Blanche Young for over 600 bbl. of 41°-gravity oil, flowing through ¾-in. choke on a 10-hour test. The discovery is in southwest Kent County.

This week in Scurry County, Magnolia Petroleum Co. 1-F McDonell estate, 341-97-H&TC, had prospects of production from the Ellenburger. Top on the Ellenburger, by samples, was 8,033 ft., or minus 5,521 ft. A 1-hour and 50-mile drill-stem test from 8,001-42 ft. had gas in 18 minutes and recovered 105 ft. of clean oil, plus 275 ft. of oil-cut mud. The new prospect is about 1 mile northwest of reef production in Kelly-Snyder field, but separated from it by Burdell Oil Co. 1 Keller, which was dry in the Canyon at 6,982 ft.

On the east side of Vealmoor Pennsylvanian field, Howard County, L. H. Armer, Ray Oil Co., and G. H. Chizum 1 S. L. Lockhart had flowing oil from the San Andres limestone. A 12-hour drill-stem test was run from 4,529-4,664 ft. Oil flowed in 1 hour and was allowed to flow into pits for 15 minutes. Turned into tanks through ½-in. choke, it produced an average of 13 bbl. of oil an hour for the next 3 hours. The choke was then changed to 3/64-in. and the well flowed for 8 hours at the rate of 7 bbl. an hour. Gravity was 35°, and there was no formation water. At the end of 12 hours and 15 minutes, the pipe was still full of oil, which headed all the time pipe was being pulled.

The Lockhart new well is about 4 miles east of the town of Vealmoor and an east outpost to the Vealmoor field, which produces from around 8,000 ft. Operators were expected to complete the well as a new pay discovery and drill a twin test to 8,000 ft. to the regular pay. Nearest San Andres production is Spraberry pool in southeast Dawson field.

Northwest of Big Spring, in northwest Howard County, Brinkerhoff Drilling Co. 1 E. Jones, gaged 387 bbl. of clean oil in 20 hours, flowing through various sized chokes ranging from 9/64-in. to 54/64-in. There was no formation water. Pay was coming from open hole in Pennsylvanian at 9,465-9,510 ft., where the section had been treated with 500 gal. of mud acid and 1,000 gal. or regular acid.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCAT

Pecos County: J. S. Merriweather, Jr. 1 Leon Farms Corp. "A," 3 mi. S Ft. Stockton field, TD 2,868 ft., pay 2,718 ft., IP 9,000,000 cu. ft. gas daily, open flow.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Borden County: Amerada Petroleum Corp. 1 L. S. McDowell, 107-25-H&TC, 4 mi. W Von Roder field, dry, TD 7,345 ft., elev. 2,314 ft.

Gulf Oil Corp. 1 Clayton-Johnson, 40-31-6N-T&P, 3½ mi. North Gail field, dry, TD 9,560 ft., elev. 2,938 ft., San Andres 3,320 ft., Spraberry 6,070 ft., Ellenburger 9,500 ft.

Coke County: Lion Oil Co. 1 Waldrop, 369-1A-H&TC, 6 mi. NE Robert Lee, dry, TD 6,638 ft., elev. 2,098 ft., Valera 2,240 ft., Noodle Creek 3,250 ft., Saddle Creek 3,540 ft., Ellenburger 6,360 ft.

Crane County: Forest Oil Corp. 1 H. R. Henderson, 17-B22-PSL, 5 mi. SW Jordan 4,500-ft. field, dry, TD 4,605 ft., Yates 2,205 ft., San Andres 3,550 ft., Glorietta 4,500 ft.

Crockett County: Coronet Oil Co. 88-A Univ. "A," 21-45-Univ. Lands, 15 mi. S Barnhart, dry, TD 300 ft. in lime.

H. D. Hudson 1 Stanolind-Univ., 12-39-Univ. Lands, shallow test in Block 39 area, dry, TD 2,000 ft.

Malco Refineries, Inc. 1 Tide Water-Bean, 11-UV-GC&SF, dry, TD 1,690 ft.

Paul McHargue 1 Stanolind-Univ. 20-39-Univ. Lands, dry, TD 1,970 ft.

E. H. Starr 1 Skelly-Univ., 30-45-Univ. Lands, 4½ mi. E Midway Lane field, dry, TD 1,641 ft.

Fred Turner, Jr. 1 Shannon "2," Tract 20, League 4, Archer CSL, 9 mi. E Iraan, dry, TD 2,515 ft.

Texas Pacific Coal & Oil Co. 1 Univ. "D," 16-14-Univ. Lands, 11 mi. SE McCamey, dry, TD 8,761 ft., elev. 2,344 ft., Yates 786 ft., Devonian 6,929 ft., Silurian 7,530 ft., Fusselman 7,560 ft., McKee 7,934 ft., Ellenburger 8,497 ft.

Texas Pacific 1 Univ. "H," 30-45-Univ. Lands, 15 mi. N Ozona, dry, TD 875 ft.

(Continued on page 144)

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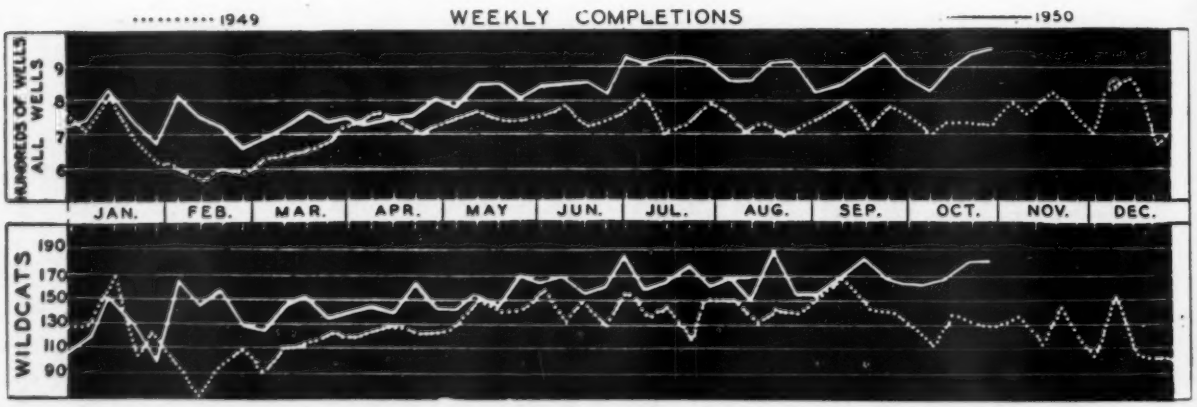
CURRENT STATISTICS

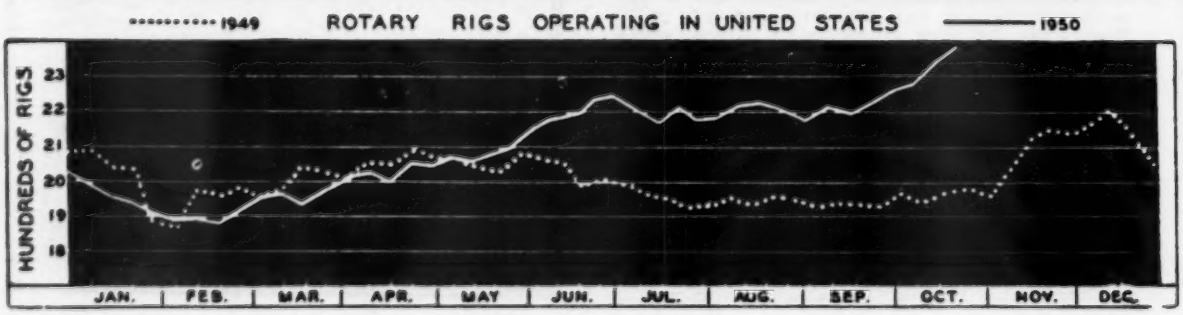
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED OCTOBER 28, 1950

	Total of all wells					Oct. 28		Wildcat completions and discoveries									
													Cumulative total, 1950				
	Comp.	Oil	Gas	Dry	Footage	1950	1949	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	15	8	0	*7	21,840	573	823	0	0	0	0	0	0	0	0	0	0
Pennsylvania	31	10	8	†13	47,609	1,121	1,345	0	0	0	0	0	0	0	1	3	4
West Virginia	17	2	12	3	45,147	551	410	0	0	0	1	1	0	0	20	18	38
Ohio	25	7	5	‡13	54,150	849	913	0	0	0	2	2	2	0	2	14	18
Indiana	28	7	0	21	43,946	1,370	1,113	1	0	0	3	4	50	0	1	216	267
Kentucky	27	14	0	13	46,111	979	799	0	0	0	0	0	23	0	1	81	105
Illinois	73	29	1	43	167,208	2,336	2,147	1	0	0	10	11	47	0	2	500	549
Michigan	16	5	0	11	34,555	733	840	0	0	0	5	5	31	0	5	247	283
Kansas	100	36	22	§42	312,008	3,216	2,700	1	0	0	17	18	95	0	11	531	637
Nebraska	4	1	2	1	21,538	104	22	0	0	2	1	3	6	0	4	47	57
Oklahoma	117	72	2	§43	393,619	4,483	3,550	5	0	0	10	15	138	6	15	547	706
Texas	371	224	12	135	1,532,533	13,563	11,103	12	1	3	79	95	418	39	100	2,172	2,729
North Central (Dist. 7-B & 9)	108	57	2	49	269,248	4,101	3,637	6	0	1	27	34	185	2	29	850	1,066
West (Dist. 7-C & 8)	125	82	1	42	640 846	4,088	2,700	0	0	1	29	30	80	2	5	426	513
Panhandle (Dist. 10)	18	12	4	2	56,786	762	795	0	0	0	1	1	1	0	2	16	19
Eastern (Dist. 5, 6, & 6-P)	16	14	0	2	69,111	943	710	0	0	0	2	2	15	5	3	162	185
Gulf Coast (Dist. 2 & 3)	61	35	3	23	327,747	1,913	1,629	3	0	1	9	13	71	18	38	321	446
Southwest (Dist. 1 & 4)	43	24	2	17	168,795	1,750	1,582	3	1	0	11	15	66	12	25	397	500
Louisiana	50	28	2	20	288,337	2,023	1,953	0	0	0	7	7	41	16	6	179	242
Northern	33	18	1	14	126,894	1,089	1,167	0	0	0	5	5	9	3	2	86	100
Southern	17	10	1	6	161,443	934	786	0	0	0	2	2	32	13	4	93	142
Arkansas	7	5	0	2	24,152	331	275	0	0	0	1	1	10	0	0	75	85
Mississippi	9	4	0	5	77,105	264	287	1	0	0	4	5	10	2	0	99	111
Southeastern States	0	0	0	0	0	49	43	0	0	0	0	0	1	0	1	27	29
Montana	0	0	0	0	0	214	213	0	0	0	0	0	1	0	0	35	36
Wyoming	8	3	2	3	48,964	480	479	1	0	0	2	3	30	0	1	71	92
Colorado-Utah	5	1	1	3	19,265	84	118	0	0	0	3	3	4	0	2	55	61
New Mexico	11	8	1	2	63,471	509	428	0	0	0	1	1	11	1	3	48	61
California	31	23	1	7	160,452	1,473	2,143	0	0	0	7	7	21	0	3	316	340
Miscellaneous (Arizona)	1	0	0	1	5,766	46	23	0	0	0	1	1	0	0	0	21	21
Total United States	946	487	71	388	3,407,776	35,351	31,727	22	1	5	154	182	929	64	178	5,300	6,471
Total previous week	934	486	85	363	3,376,007			25	2	6	149	182	907	63	173	5,146	6,289
Total October 28, 1949	736	413	49	274	2,491,494			22	1	1	105	129	787	74	162	4,619	5,642

Service wells included: *7, †12, ‡2, §1





DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 28 crude oil	B. of M. Oct. demand	Oct. 21 crude oil
Arkansas	2,300	1,600	2,300
Arkansas	82,550	90,000	82,750
California	939,500	930,000	936,900
Colorado	72,200	67,000	64,600
Eastern	63,750	65,000	63,800
Florida	1,425	1,400	1,475
Illinois	174,500	188,000	178,600
Indiana	30,700	31,000	31,800
Kansas	299,450	308,000	303,800
Kentucky	29,100	30,000	29,300
Louisiana	581,900	600,000	581,600
North Louisiana	116,900	.....	116,600
South Louisiana	465,000	.....	465,000
Michigan	44,300	47,000	44,300
Mississippi	108,000	120,000	108,950
Montana	22,100	24,000	22,200
Nebraska	4,700	5,000	4,700
New Mexico	131,825	154,000	131,825
Oklahoma	490,000	470,000	487,300
Texas	2,570,725	2,330,000	2,570,725
Dist. 1 (Southwest)	31,000	.....	31,000
Dist. 2 (Southwest)	150,050	.....	150,050
Dist. 4 (Southwest)	233,250	.....	233,250
Dist. 3 (Gulf Coast)	450,875	.....	450,875
Dist. 5 (Eastern)	42,950	.....	42,950
Dist. 6 (Eastern)	102,225	.....	102,225
East Texas field	296,000	.....	296,000
Dist. 7-C (West)	70,800	.....	70,800
Dist. 8 (West)	870,550	.....	870,550
Dist. 7-B (W. Central)	78,700	.....	78,700
Dist. 9 (N. Central)	154,325	.....	154,325
Dist. 10 (Panhandle)	90,000	.....	90,000
Utah	3,700	4,000	3,700
Wyoming	166,500	174,000	164,900
Total United States	*5,819,225	5,640,000	5,821,525
Change from prev. week, down	2,300		
Canada	77,400		99,850

Total U. S. production January 1-October 28 †1,607,594,905 bbl.
Same period last year (crude plus cond.) 1,524,259,340 bbl.

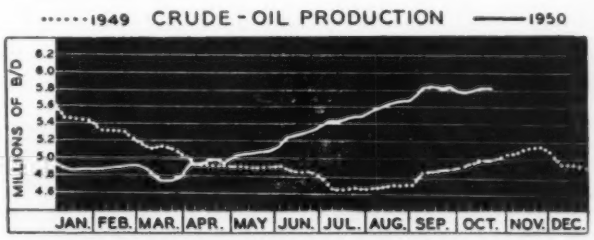
*Not including 98,295 bbl. condensate. †Including 29,306,725 bbl. condensate.

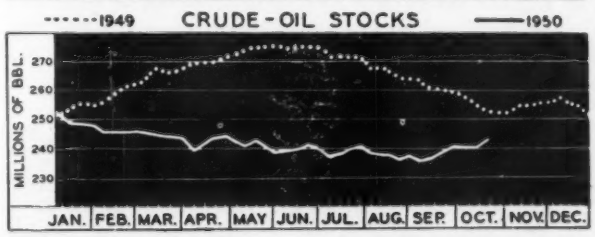
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

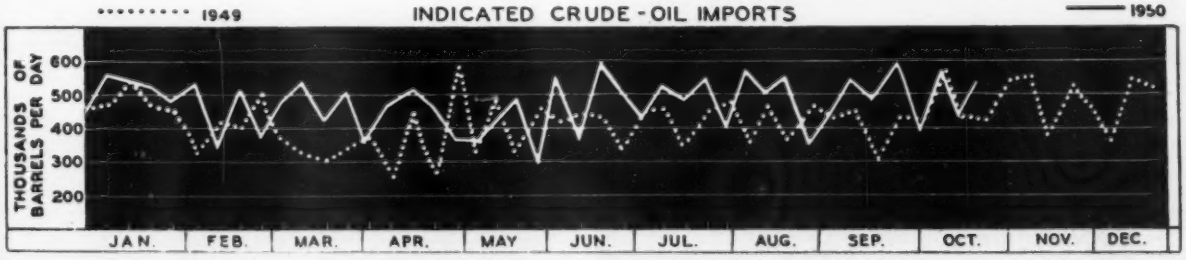
(Thousands of barrels)

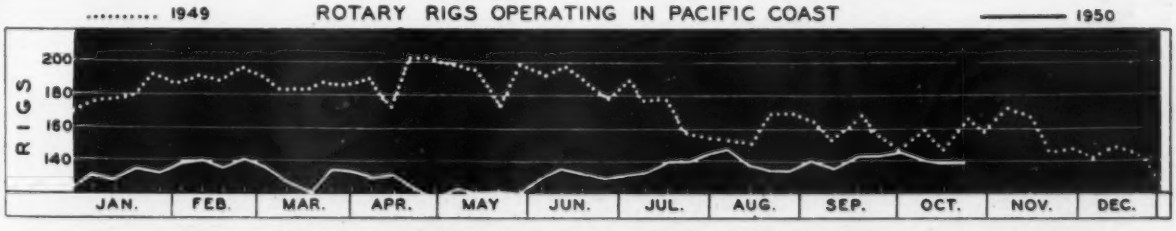
	Oct. 21, 1950	Oct. 14, 1950	Oct. 22, 1949
Pennsylvania Grade	2,256	2,335	3,307
Other Appalachian	1,500	1,344	1,916
Illinois, Indiana, Michigan	9,217	9,169	11,680
Arkansas	2,608	2,937	2,486
Louisiana	14,277	14,194	12,948
North	3,168	3,093	3,146
Gulf	11,109	11,101	9,802
Mississippi	2,597	2,399	2,469
New Mexico	6,743	6,925	7,130
Oklahoma and Kansas	37,331	36,565	36,777
Texas	119,093	117,740	116,112
East Texas	14,520	13,840	16,941
West Texas	46,447	46,692	44,195
Texas Gulf	28,763	28,357	28,788
Other Texas	29,363	28,851	26,188
Rocky Mountain	10,797	10,531	14,257
California	30,494	31,055	36,692
Foreign	6,423	5,923	6,884
Total	243,336	241,117	252,658

*Bureau of Mines.









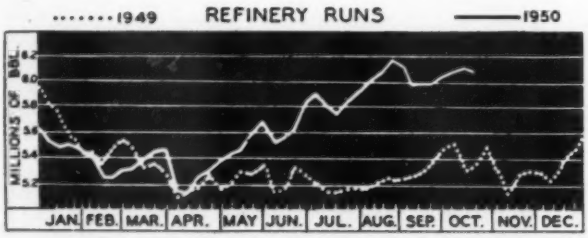
XUM

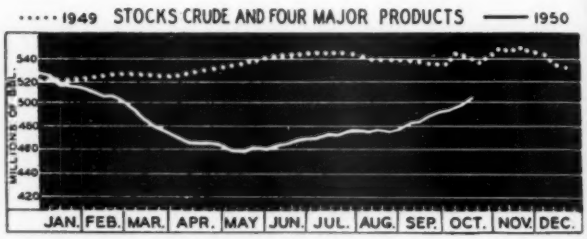
A.P.I. REFINERY REPORT, OCTOBER 21

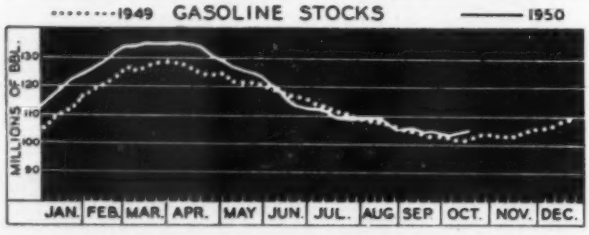
(Thousands of barrels)

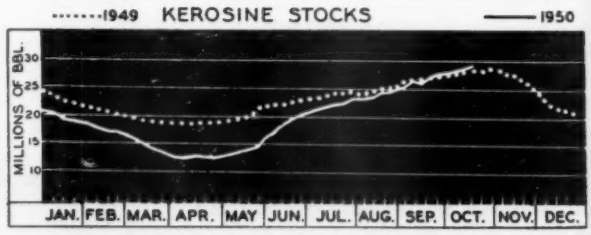
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, October 1949				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	907	367.0	40.6	185.7	191.8	25,869	10,829	25,547	11,942	777	319.8	25.4	172.3	176.9
Appalachian:														
District 1	114	49.3	8.9	15.0	10.8	2,631	501	901	430	98	46.9	5.0	13.2	10.0
District 2	71	34.0	5.1	6.7	11.3	1,175	226	279	146	67	35.1	4.1	7.2	13.6
Ind., Ill., Ky.	1,076	585.4	70.1	183.7	149.4	20,831	5,892	14,344	5,045	925	504.7	57.6	126.8	142.0
Okla., Kans., Mo.	517	285.9	15.4	109.3	58.3	10,144	1,441	8,704	1,329	418	241.6	14.4	82.1	60.9
Inland Texas	207	140.1	11.6	28.0	34.3	3,314	521	1,275	646	214	140.5	10.4	27.9	42.4
Texas Gulf Coast	1,507	700.9	101.3	356.9	281.0	16,276	4,651	12,778	6,116	1,325	606.1	81.4	282.0	233.8
La. Gulf Coast	482	223.3	54.1	101.6	61.3	6,693	2,967	4,024	2,304	456	220.8	47.2	106.3	60.8
N. La. and Ark.	71	30.3	7.7	16.9	9.9	2,059	469	855	182	73	30.9	6.3	10.6	15.0
Rocky Mountain:														
New Mexico	14	7.3	.4	2.3	3.9	85	25	42	33	10	5.8	.2	1.7	2.6
Other Rocky Mtn.	165	72.9	5.3	34.1	35.6	2,820	412	2,059	743	194	89.9	5.7	34.9	33.6
California	947	403.6	4.6	143.1	393.8	13,773	678	12,038	15,095	870	375.1	12.1	136.6	318.4
October 21, 1950	6,078	2,900.0	325.1	1,183.3	1,241.4	105,670	28,612	82,846	44,011	5,427	2,617.2	269.8	1,001.6	1,110.0
October 14, 1950	6,124	2,870.0	338.0	1,267.7	1,203.7	103,807	28,555	80,959	42,826					
October 22, 1949	5,375	2,638.0	290.0	979.4	1,087.0	102,990	28,340	89,030	69,673					

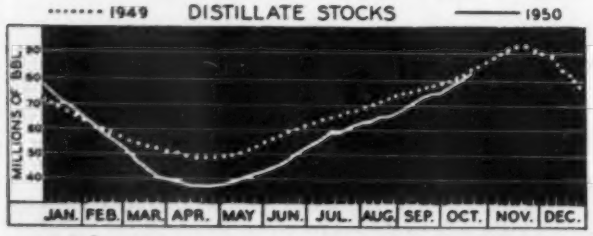
*At refineries including natural blended. †Finished and unfinished.

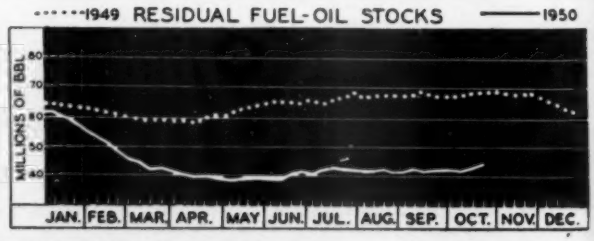


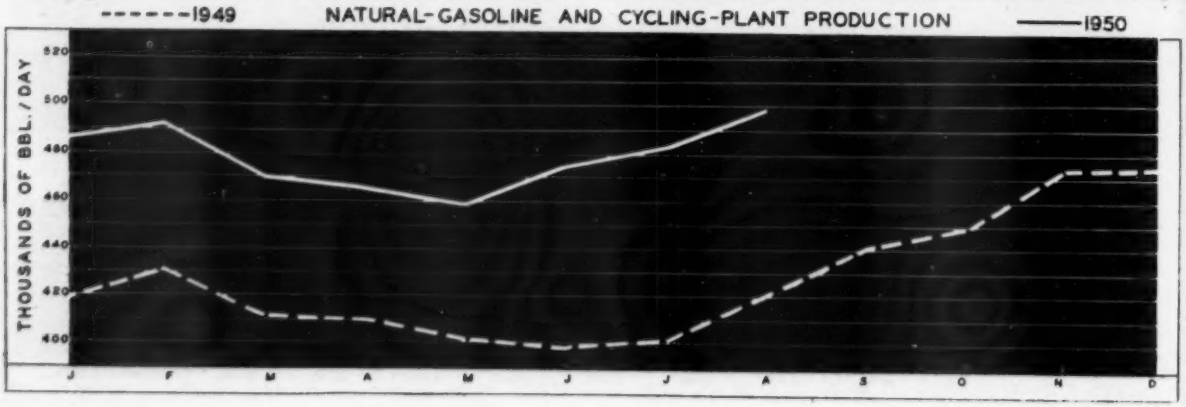












CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.76	....	....	....
19-19.9	1.83	....	....	....
20-20.9	1.90	$2.25	....	$2.12
21-21.9	1.97	2.27	....	2.14
22-22.9	2.04	2.29	....	2.16
23-23.9	2.10	2.31	....	2.18
24-24.9	2.17	2.33	$2.56	2.20
25-25.9	2.24	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.10
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

PETROLEUM markets in general are feeling the effects of the between-season lull in demand for petroleum products. Gasoline demand has passed the peak, and refineries and terminals will not feel the load from increased consumption of heating oils until users have burned part of the fuel now in their tanks and have had their first refills from resellers. Primary inventories of the four major products increased 4,992,000 bbl. for week ended October 21.

Further increases in tanker rates were reported October 25, following a 2-week period in which the Gulf-East Coast rate had been 45 per cent over the Maritime Commission's base. The return to the upward trend was indicated when two clean boats were fixed at 60 per cent over the base. At least one dirty boat was fixed at 50 per cent over the base, according to reports. These increases tend to add to the lack of balance between Gulf Coast and East Coast market prices.

Another factor in the unbalanced price situation was the announcement by Gulf Oil Corp. of its reduction of residual prices to the level existing before the price advance earlier in the month. Except for the quotations of a few independent marketers, residual on the New York Harbor market is selling for $2.15 a barrel. The cargo price on the Gulf Coast market is $1.75, and transportation to New York at the new rate would be about $.65 a barrel.

Gasoline is the only major product on which a spot buyer can break even on the New York market if the product is purchased on the Gulf Coast spot market and moved to New York at present tanker rates.

Most of the Gulf Coast spot sales are for barge movement up the river, and only a shortage of barges may prevent a heavy movement which would affect Group 3 prices.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotation of leading suppliers as of October 30, 1950. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅜-10½	12-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11⅜	13-13.75	11½-12
42-44 w.w. kerosine	8⅞-9⅛	10-10.1	8½-8¾
No. 2 straw fuel oil	8⅛-8¾	9	7½-7¾
No. 6 residual	$1.65-1.75	$2.15-2.25	$1.75-1.85

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6⅞	5⅞	6¼
Grade 18-55	7.65	7.15	7.4

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12.5-13
750 vis., No. 3-4 neutral	14.75
2,000 No. 5-6 neutral	16.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock 0-10 pp.	27-28
200 vis., No. 3 neutral, 0-10 pp.	16.5-18.5

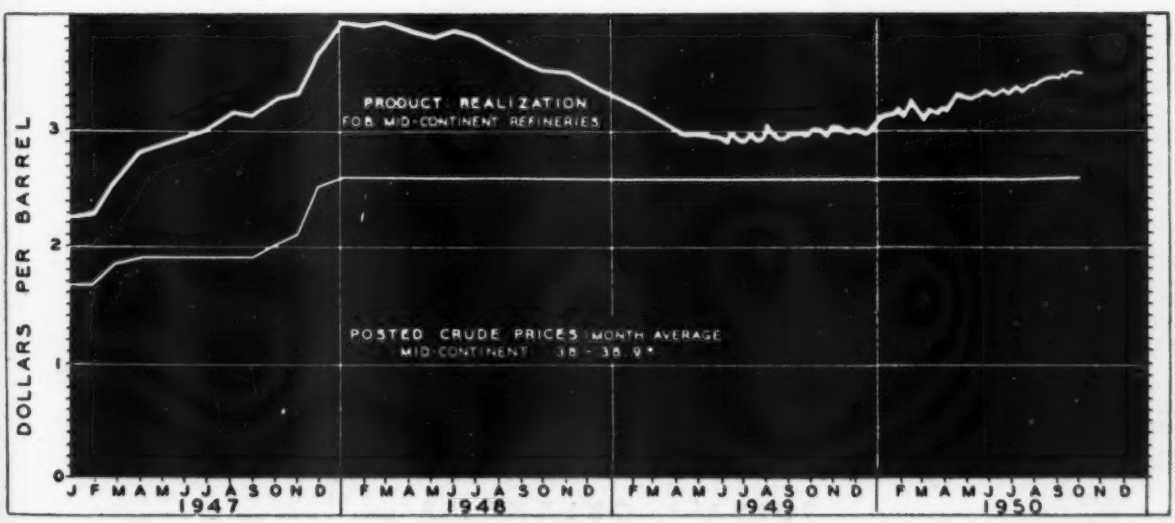
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	29.5
180 vis., 0 p.t. neutral	30.5

WAX

Mid-Continent

132-134 A.M.P.	5.0


DOLLARS PER BARREL
3
2
1
0
PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1947
F M A M J J A S O N D
1948
F M A M J J A S O N D
1949
F M A M J J A S O N D
1950

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.49 for week ended October 21, $3.49 for previous week, and $3.03 for October 1949.

1950-1951 DIRECTORY OF REFINERIES . . . . . .

The Oil and Gas Journal's DIRECTORY of REFINERIES and NATURAL GASOLINE PLANTS is just off the press. It gives you titles, names and addresses of key men in all major departments. It is an 103-page bound volume of size convenient for library or file.

This is what you get:

1. An alphabetically arranged list of over 400 refineries in the United States and Canada, showing more than 3600 of their key operating, purchasing, and technical personnel.

2. A similarly arranged list of over 475 Natural Gasoline Plants and Cycling Plants throughout the country, with the main office, plant location, and key personnel in excess of 1825.

3. In all, over 5400 key personnel are listed in this directory, an average cost of $1.60 per 1000 names.

4. A geographically arranged survey of the active refineries in the United States, Canada and Mexico, showing their crude oil and cracked gasoline capacities and the type of products manufactured . . . plus a list of refineries that are now shut down.

5. A survey of the Gasoline and Cycling plants in each state, showing input and output capacities.

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THE OIL AND GAS JOURNAL

TULSA 1, OKLAHOMA

EQUIPMENT MEN . . . in the News

Greene Promoted to Assistant Manager by Crane Co.

J. W. Greene has been appointed to the newly created position of assistant manager of the valve and fitting department, Crane Co., Chicago.

Greene is particularly well qualified for this new responsibility as a result of 12 years of experience in the oil fields of the Southwest; 10 years in the New York and eastern industrial markets, and 5 years in the Midwest. His most recent position with the company was sales manager of the New York branch.

Haston Made Mid-Continent Supply District Manager

Vernon H. Haston, a native of Kansas who has been associated with Mid-Continent Supply Co. since 1947, is the company's new district manager at Great Bend, Kans. Promotion of Haston to his new position coincided with the announcement that the company's district office has been moved from Wichita to Great Bend. Mid-Continent now is represented in Wichita by J. M. Woods, who is in charge of the company's sales office, and A. R. Tune, sales representative.

V. H. HASTON

The changes in Mid-Continent's Kansas organization were announced from the Fort Worth headquarters of the company by Ken W. Davis, president and general manager.

Haston joined Mid-Continent as the first manager of the company's store at Great Bend. In May 1949 he advanced to the job of district sales representative, with headquarters at Great Bend, and remained in that position until taking over the duties of district manager.

Bethlehem Announces Field Organization Changes

Bethlehem Supply Co., has announced several personnel changes throughout the company organization. C. E. Barnard, formerly chief clerk of the Tulsa sales office, has been transferred to the Dallas sales office as office manager. H. E. Arnold, formerly chief clerk for the division managers, has been promoted to chief clerk of the Tulsa sales office, replacing Barnard.

P. W. Behrents, formerly in the engineering sales department of the Tulsa general office, has been promoted and transferred to Odessa, Tex., as engineering representative. I. H. Correll, formerly store manager at Craig, Colo., has been transferred to Grayville, Ill., as field representative in order to increase sales coverage in that area. V. H. Prange, formerly field representative at Houston, has been transferred to McAllen, Tex., and promoted to store manager.

D. G. Shank has been transferred from Lake Charles to Harvey, La., and promoted to field representative to assist in field sales in that area. B. M. Queen, field representative at Kermit, Tex., has been transferred to Artesia, N. M., in the same capacity. J. W. Jillson was recently employed as field representative, and will work out of the Odessa, Tex., store. L. F. Ritchie, formerly field representative at Odessa, has been promoted to special representative. D. R. Nicholson, located at Odessa, has been promoted to manager of the pump shop at that store.

Totco Opens Expanded Production Facilities

New machine tools at the Totco plant including Swiss automatics, turret lathes, and gear burnishers have been installed to increase the productive capacity of the plant.

Technical Oil Tool Corp., Ltd., Los Angeles, recently opened a new section of several thousand square feet of floor space at its Los Angeles manufacturing plant, according to H. H. (Pete) Peters, vice president of the corporation.

Peters explained that the expansion was necessary not only to handle production of present Totco instruments, but for new instruments which will be on the market later this year.

Hammel-Dahl Announces Two Executive Appointments

J. O. TRAGARD

M. MacDONALD

Hammel-Dahl Co., of Providence, manufacturers of automatic control equipment, has announced the following appointments: John O. Tragard, vice president in charge of sales and contracts, and Maurice MacDonald, vice president and manager of engineering.

Tragard, for 20 years with Foxboro Co. as sales executive and legal counsel, and 4 years with Fulton Sylphon Division of Robertshaw-Fulton Controls, brings to Hammel-Dahl a successful record in sales and service management.

MacDonald has been associated with Johns-Pratt Co. and Bussman Co. of St. Louis. In 1932 he joined M. W. Kellogg Co. and for the past 8 years was chief engineer in charge of instrumentation and control.

Caterpillar Makes Changes In Executive Structure

Broadening of the executive structure of Caterpillar Tractor Co. has been announced by President Louis B. Neumiller. The change includes creation of an additional executive vice presidency together with promotion of four administrative and departmental heads.

Personnel figuring in the announcement and their new posts include: Harmon S. Eberhard, executive vice president; William Blackie, who will coordinate with Peoria the administration of the Joliet and San Leandro plants and Caterpillar Tractor Co., Ltd., new British subsidiary; E. W. Jackson, vice president; Ralph M. Monk, vice president; W. H. Franklin, who will assume administrative direction of the accounting and the traffic and order departments; and A. N. Whitlock, who will assume direct supervision of accounting.

Eberhard, who has been a vice president since 1942, will share with Executive Vice President A. T. Brown and President Neumiller the increas-

XUM

ing responsibilities of top administration.

A vice president since 1944, Blackie will continue administrative direction of the merchandise department in addition to his new duties. Retaining his present title, Controller W. H. Franklin will assume administrative direction of the accounting and the traffic and order departments.

Jackson, who has been director of parts and service since 1947, will continue administrative direction of those departments as a vice president. Vice President Monk will also continue his administrative direction of the industrial and labor-relations departments, which he has headed since 1938.

Indian Drilling Mud Adds Twin Beech to Equipment

This twin-engine Beech has been added to the service facilities of Indian Drilling Mud Co. The plane, which will be piloted by Joe Patterson, is equipped with a complete laboratory for well-side service where and when such immediate attention is needed. Indian Drilling Mud also operates a Spartan Executive which is similarly equipped.

Kerotest Acquires Rights To New Type Plug Valve

Manufacturing rights have been acquired by Kerotest Manufacturing Co., Pittsburgh, to produce a new type of plug valve which has been under development and production by General Valve Service Co., Long Beach, Calif.

The valve, according to Stanley J. Roush, president of Kerotest, is a new type of nonlubricated plug valve which is designed especially to provide ease of operation at normal to subnormal temperatures and a vapor-tight shutoff in all types of gaseous and volatile-liquid service including liquid oxygen, liquefied petroleum gases, crude and lubricating oils, gasoline, and refinery products.

Jirasek to Head Petrochem Sales for Worthington

John V. Jirasek has been appointed manager of sales activities in the petrochemical industries for Worthington Pump & Machinery Corp., it has been announced by Walther H. Feldmann, vice president in charge of sales. Jirasek holds a chemical-engineering degree from University of Prague and undertook post graduate work at Sorbonne, Paris. In 1941 Jirasek joined Worthington as special representative to the petroleum and chemical industries.

Prior to his association with Worthington, Jirasek was connected with M. W. Kellogg Co. in the United States and with its European representative, the Companie Technique des Petroles in Paris, and Sharples Corp., in Philadelphia.

American Meter Elects Diehl as President

JOHN C. DIEHL

The board of directors of American Meter Co. has announced the election of John C. Diehl as president. In 1919 Diehl joined the staff of American Meter Co. as an engineer, and was elected to the post of chief engineer in 1929. In 1934 he was made vice president.

Diehl is the author of numerous technical articles and books on gas measurement. Three of his books, Measurement of Gases, Natural Gas Handbook, and Natural Gas Measurements, have won national recognition as text books on these subjects. Norton McKean, president of American Meter since 1941, has resigned.

Somastic Completes 20th Year of Industry Service

Somastic Pipe Coating has recently completed its twentieth year of commercial service. This asphalt-mastic protective treatment is applied by Bechtel Corp. of San Francisco and Los Angeles, and by H. C. Price Co., Bartlesville, Okla.

Central plants are operated by Bechtel at Wilmington, Calif., and by H. C. Price at New Orleans and Philadelphia. Many coated lines have been serviced by railhead plants set up adjacent to the pipe-line area, a method which combines speed and economy.

During the past 2 years improved manufacturing and inspection methods have been developed providing close controls of ingredients, maximum coating density, freedom from foreign metals, and inspection equipment of high efficiency.

Bechtel Corp.'s Somastic plant located at Wilmington, Calif., near Los Angeles will be open to inspection by A.P.I. convention visitors.

Pyrene Appoints Stentz as Petroleum Industry Agent

Appointment of Stentz Equipment Co., Tulsa, to handle the engineering and sales of Pyrene air-foam systems to the oil industry has been announced by Pyrene Manufacturing Co., Newark, N. J.

The Stentz organization, including branch offices in Houston and Dallas will serve throughout the states of Texas, New Mexico, Oklahoma, Kansas, Arkansas, Nebraska, Colorado, Wyoming, Montana, Missouri, South Dakota, western North Dakota, and western Louisiana.

Pyrene air foam is produced by physical or mechanical means. It was developed and introduced by Pyrene Manufacturing Co.

Studer Made Chief Engineer For Empire Machinery Co.

Empire Machinery Co., Ltd., through D. F. Payte, its general manager, recently made public the selection of E. A. Studer as its new chief engineer.

Studer is a former staff member of the firm, whose headquarters are in Odessa, Tex. He will supervise all engineering work in connection with the shop and machinery sales.

Studer brings to Empire valuable experience in technical engineering matters, gained through recent professional service with Dynamatic Corp., makers of electric rig brakes. He is a graduate mechanical engineer. He is well acquainted with engineering problems of the oil industry, having done both plant and field work in the Permian basin of West Texas and eastern New Mexico for many years.

Simultaneously, Empire Machinery announced the transfer of W. K. (Kenny) Richey from Odessa to Abilene. Richey will be the Abilene district manager, in complete charge of sales and service for Empire in the area.

Chemical & Geological Lab Suffers Small Fire Loss

One of nine fires set by an arsonist in Casper, Wyo., recently damaged the facilities of Chemical & Geological Laboratories, Casper. Loss to the plant was confined to one wing containing offices and some pressure-volume-temperature equipment.

Geological, engineering, and sales offices of the firm were immediately moved into an adjoining building where normal operations were resumed. Pressure-volume-temperature equipment will be replaced quickly and all services offered by the company are available for immediate service.

Since Casper fire-fighting equipment was engaged at other fires, a volunteer fire force from the suburban town of Mills was called to the blaze and kept losses to a minimum.

Wagner Electric Corp. Entertains at Open House

Wagner Electric Corp. conducted an open house at its plant in St. Louis on October 14 and 15. Arrangements for the plant visit were made by L. C. Dobrunz, sales promotion manager. More than 15,000 stockholders, suppliers, and customers toured the entire plant during the 2 days.

Purpose of the event was to acquaint industry with the large number of electrical and automotive products manufactured and sold by Wagner. A special exhibit of all Wagner products was displayed and visitors were given an opportunity to inspect production and assembly lines throughout the factory.

Founded in a small store building in 1891, the company has grown steadily until now its plants occupy about 1,600,000 sq. ft. of floor space extending over 60 acres. In addition to the main office and factory in St. Louis, Wagner has plants in Edwardsville and Mount Vernon, Ill., and branches in 31 cities throughout the country for sales and service of Wagner products. It was founded as a manufacturer of motors and transformers but now fabricates starting and ignition equipment, hydraulic brakes, air brakes, brake lining, hydraulic brake fluid, brake parts and tools, and other related products.

Principal officers of the firm are: P. B. Postlethwaite, chairman of the board; J. H. Devor, president; F. F. Simon, vice president and controller; G. A. Waters, vice president; H. J. Felton, vice president; K. M. Coggeshall, assistant vice president; J. D. Eby, secretary and treasurer; and L. W. McBride, assistant secretary and assistant treasurer.

Wagner motors and transformers in the exhibit hall were of interest to many guests.

Stevens, Nedderman Named To Edward Executive Posts

Appointments of John E. Stevens, Jr., as assistant to the president, and of C. W. Nedderman as assistant vice president, have recently been announced by W. F. Crawford, president, Edward Valves, Inc., a subsidiary of Rockwell Manufacturing Co., Chicago.

J. E. STEVENS

C. W. NEDDERMAN

Stevens is a graduate engineer of Polytechnic Institute of Brooklyn and took advanced work at New York University graduate school of business administration. Prior to joining Edward he was vice president of Bergen Genspring Corp., New York. Previously, he had been assistant manager of engineering of M. W. Kellogg Co. and in sales engineering with Eagle-Picher Co. and Sarco Co.

Nedderman joined Edward in 1948. Previously he had been president and general manager of Universal Camshaft Co., controller of Muskegon Motor Specialties Co., and director of budgets of De Vilbiss Co. He attended Purdue and Notre Dame universities.

Ohio Injector Streamlines Field Sales Organization

Ohio Injector Co., of Wadsworth, Ohio, in a move designed to integrate sales services at the distributor and customer levels, has announced the establishment of five major sales divisions, each functioning under a field manager who reports to H. G. Smith, vice president in charge of sales.

Commenting on the new sales structure, Smith said: "Our objective is to assist distributors' salesmen, to offer technical assistance on special projects, and to render supervisory services to increase sales through our distributors."

The new sales divisions and the respective managers are: New York division, New York City, southern Connecticut, and northern New Jersey, Daniel J. Mooney, Jr., New York; Atlantic division, Mobile, Ala., to Portland, Me., excepting New York division area, Paul E. Warner, Philadelphia; Central division, Minneapolis to Buffalo, St. Louis to Pittsburgh, W. G. Shepard, Wadsworth; Mid-Continent division, Denver to Kansas

(Continued on page 143)

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USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES. E. A KELLY, BOX 861, OKLAHOMA CITY PHONE 5-6407.

WELL equipment. New and used spudders, rotaries, core drills, all sizes and types. Cable tools, drill pipe, bits, pipe. Fishing tools rented. Everything for well service. Pressey & Son, Pueblo, Colo.

FOR SALE: Two No. 2-A National Drilling Machines with steel masts. Located at the Davis Pipe and Supply yard at Chanute, Kansas.

IMPORTANT lot of "VICTAULIC" grooving and cutting tools for pipes, 2 in. to 4 in. and 4½ in. to 6 in. In perfect state, some never used. Bargain prices for quantities. Apply to Delvaux, 62. Square des Latins, Brussels, Belgium."

ROD AND TUBING UNIT Model A Kiltner, 48 ft. Telescope Mast, mounted on 1947 Dodge truck. All in A-1 condition. Harry L. Williams, Lost Springs, Kansas.

FOR SALE

2 Rod & tubing Units, mounted on 6 X 6 G.M.C. Trucks
#1 Wilson Super Model with Whichtex single pole telescopic mast. Price $3500.00.
#2 Wilson Super Model, with Wilson double leg telescopic mast. Price $4000.00.
Both Units equipped with 2" and 2½" Tubing & Rod tools & lines. Ready to go. Quitting rod & tubing business.

FOX WELL SERVICING CO.
Box 488, Healdton, Okla.

SURPLUS MACHINERY

2—New C. H. Wheeler, Solid Bronze, Horizontal Single Stage Centrifugal Pumps, 1500 GPM, 55' Head, 12" Suction, 8" Discharge, Connected Terry Turbines, 55 HP, 250# Pressure, 10# Back Pressure, 1500 RPM . . $2250.00 Ea.

1—New Aurora Pump, Type OMB, 8"x10", 2000 GPM, 300' Head, 3000 RPM, Mounted on Steel Base For Turbine . . . . . $750.00 Ea.

1—Slightly Used Elliott Turbine, Type CY, 240 HP, 250# Pressure, 26" Vacuum, 10# Back Pressure . . $1250.00 Ea.

2—Slightly Used Dean Bros., 8"x7"x18"-12"x7"x18" Simplex Pumps, 90 GPM, 400 PSIG, For Butane or Propane . . . . . $750.00 Ea.

1—Slightly Used Union 14"x8"x12" Simplex Hot Oil Pump, 750# 650° F. 100 GPM, Serial #176763 . . . . . $500.00 Ea.

1—Used Wheatley Bros. 5"x10" Enclosed Gear Driven Power Pump, Model WBM, 2044, with 3½" CI Liners, 450#, 128 BPH, Direct Connected to Model BTH Buda Engine Mounted on Single Skid . . . . . $1750.00 Ea.

All Units FOB Tulsa, Oklahoma.

H. A. McCarthy
319 Thompson Bldg. Phone 5-2296
Tulsa 3, Okla.

EQUIPMENT FOR SALE

3 PHASE 60 CYCLE GENERATING UNITS One—140 KW and One 60 KW—2300 Volt Fairbanks-Morse Diesel Type Complete with panel. One 125 KW 480 Volt 514 RPM Electric Machinery Engine Type Generator with exciter. One 35 KW 480 Volt 900 RPM Generator with exciter. Alfred B. Kern, 223 Wright Bldg., Tulsa, Oklahoma.

OILWELL No. 5 draw-works, two D-13000 Caterpillar, Oilwell 27½" rotary table, Ideal model B 7¼" x 14" pump. Sale price $15,000.00. Adams Drilling Company, Brush, Colorado.

FOR SALE: Clark Triplex Mud Pump. Has run 1200 hours. Bargain. Box D-737, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE electric magnetic fishing tool outfit, with magnets capable of lifting 1,000 pounds, adaptable for fishing junk like drilling cones and such out of oil wells. 2507 Mercantile Bank Building, Dallas, Tex.

STEEL TANKS

7—55,000 Bbl. Wood Roof
3—55,000 Bbl. Steel Roof
PRICES QUOTED ON REQUEST
TANCRED STEEL CONSTRUCTION COMPANY
Dallas, Texas
Box 5885 Prospect 3717

EQUIPMENT FOR SALE

4—175 H.P. Heine Water Tube Boilers. 24—4" Series 1500 Flanged End T & G Nickelalium Steel Ells. 38—24", 80—20", 40—18", 122—16", 50—10" Steel weld-neck and Slip on Flanges. Bourland Supply Co., Pampa, Texas.

REVERSE Circulating Drilling Rig consisting principally of Type J Guiberson head; 53GA King swivel; 3" x 28' Guiberson kelly, Waukesha XAHU rotary motor; 5 x 8 Gardner-Denver pump with Mercury motor; 7' x 12' steel tool house, circulating tank; 2—4" x 20' drill collars; hose, valves, miscellaneous connections. All equipment practically new. Price: $8,500. McDaniel Well Service, Seminole, Okla.

POWER RIG FOR SALE

In West Texas
Wilson Titan Drawworks

With 3 LRO Waukesha engines, Clark Triplex Pump, derrick and substructure, completely equipped and ready to go.

Box D-736

The Oil and Gas Journal
Tulsa, Oklahoma

FOR SALE

100,000' 12¾" O.D. 41.51# API spec. 5L, grade B, seamless line pipe, beveled ends.
48,644' 5½" 14# J 55, seamless casing, Short T & C, range 2, 8 R T.
78,400' 7" 20# J 55, seamless casing, short T & C, range 2, 8 R T.
2" 4.70# seamless external upset tubing, J 55, range 2, 8 R T.
All above new material.

J. P. NAHAS
Snyder, Texas, P.O. Box 638, Phone 1129

LINE PIPE FOR SALE

118,000' 4" O.D. x .165" Wall Seamless, 6.5#, Used as sweet gas line, taken up in 30' Lengths. Available for immediate inspection and delivery, FOB Mobeetie, Texas.

175,000' 6⅝" O.D. 18.97# Excellent Grade Used Lapweld. Machine Cleaned. Torch Beveled Ends 30°, 20' RML.

18,000' 10¾" O.D. 40# Good Used Lapweld, P.E., 20' Lengths

CASING & TUBING

30,000' 2⅜" O.D. 4# Good Used Lapweld Range 1 Tubing with New 10 Round Threads and Collars.

15,000' 2⅜" O.D. 6.4# New Seamless Range 1 and 2 Tubing. Available Plain Ends or 10 Round Thread T & C.

6,000' 8⅝" O.D. 25# Good Reconditioned Casing, 8 V-Thrd. T & C Range 1.

100,000' 8⅝" O.D. 28# Good Grade Used Lapweld Plain End Pipe.

2,000' 9⅝" O.D. New Seamless Casing, Range 1 and 2.

OTHER SIZES OF LINE PIPE, SEAMLESS TUBING IN SUITABLE SUBSTITUTE SIZES FOR STANDARD PIPE (EXCELLENT FOR GAS, GATHERING AND FLOW LINES), CASING AND TUBING AVAILABLE FOR IMMEDIATE DELIVERY.

FOR FURTHER INFORMATION, WIRE OR PHONE AT ONCE

A. J. STRUBEL
SIDney 1791 . . . 4946 Murdoch, St. Louis, Mo.

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 197, Red Fork Station, Tulsa, Oklahoma

6,218 FEET 7" O.D. 17# new seamless casing H-40 Rg 2 @ 2.90 ft. Phone 5-8850, Tulsa.

CORE-DRILL Equipment for Sale: Franks Model "2,000" rig, mounted on KR-11 International Truck, complete with 38' derrick, Gardner-Denver 5x8 power mud pump, 1,000 watt Kohler light plant, and standard operating accessories. Contact Mr. J. D. Baker or Mr. W. H. Hawkes, P.O. Box 1654, Oklahoma City, Oklahoma. Telephone No. 3-6381.

FOR SALE: Diesel powered Star Spudder No. 243 2500' complete with tools and lines now operating in NE Oklahoma. Box D-752, The Oil and Gas Journal, Tulsa, Oklahoma.

AMPHIBIOUS airplane: Eight place twin-engine Grumman Goose for sale or lease. Formerly owned by large oil company, excellent condition. Richard French, Genesee Airport, R.D. 2, Rochester, New York.

CARDWELL double pole telescoping mast, Cardwell spudding attachment, cable tools, sand lines, drilling lines, bailers, tubing tools. Phone 443 Yukon, Okla., or 6-1615, Okla. City.

CATERPILLAR D-8 with Hydraulic Bulldozer, excellent condition, $8500. Caterpillar D-7 with Hydraulic Bulldozer, 300 hours $11,000. Caterpillar D-6 with Cable Bulldozer, 300 hours, $9500.00 All above guaranteed. Martin Tractor Co., Phone 73, Chanute, Kansas.

AVAILABLE for sale and immediate shipment #1 T & C 2" line pipe, seamless and lapweld casing, tanks. Call or write Edco Pipe & Supply Company, Box 565, Drumright, Oklahoma.

WAR SURPLUS MACHINERY
Gaso, Byron Jackson, Aurora, Wayne, Lombard & Hale Fire Pumps with Engines, 1½ to 25 KW Generator Sets or Light Plants, Engines, Suction Hose, Fire Hose, Victaulic Couplings & Etc. Write for listing. H. A. McCarthy, 310 Thompson Bldg., Phone 5-3296, Tulsa, Oklahoma.

MOBILE FIELD OFFICE WITH LIVING QUARTERS. Chevrolet-powered, 32-passenger bus, good motor, tires; equipped with double-deck bunks, sofa, camp cooking facilities, table, ice box, numerous cabinets. $750. Inspection at 4614 Munger Ave., Dallas, Texas, or write for description.

F-8 FORD Super Cementing and Acidizing Unit complete; 2 Gasco pumps, 4½ x 10 and 3¼ x 10, with brass lines; split jackshaft and 135 HP Waukesha motor; measuring line, swedges, plugs and containers. Severin Johnson, Box 1005, Coleman, Texas.

FOR SALE

9—230 H.P. Bessemer Type 10 Engines with compressors, Steel Buildings, Valves and Fittings complete for installation. Located Salem, Illinois Oilfield.

ENGLE PETROLEUM, INCORPORATED
Box 655, Evansville, Indiana
Telephone 5-5179

D-13000 Caterpillar, Dual fuel, Twin Disc P10 heat exchanger safety station. Electric starter, 570 hr. Council Grove Ice Co., Wesley Steinhoff, Council Grove, Kansas Phone 213.

1—Model 36-L Bucyrus-Erie Spudder mounted on skids, equipped with casing tackle strut, Waukesha GK-140 Gas-gasoline engine with butane attachments, about 3500 feet of ⅞" and ½" lines, and ⅞" tubing line, steel dog house, junk rack, and butane tank. Excellent condition. Price $16,000.00. Also available tailing in or top to bottom tools. 1—Model 24-L Type "EB" Spudder with 48 foot derrick, casing tackle strut, catheads, HP326 engine, cables, steel dog house, Kohler light plant, and complete tools for 6⅝", 8", and 10" hole, derrick house and platform. Price $10,000.00. 1—Model 21-W Bucyrus-Erie truck mounted Water Well machine with tools for 6" and 8" hole. Price $3250.00. Randall-Zogg Supply Co., Princeton, Indiana.

8-IN. PIPE FOR SALE

Approximately 200 miles of 8" 29.02# line pipe being taken up. This pipe was used in a 650# Pressure Products Line. Pipe subject to prior sales f.o.b. Pittsburgh District.

Wire or Write if interested.

Box 574, Tulsa, Oklahoma

BOILER

1—Union Iron Works Type L 3950 sq. ft. surface, 300 psig. WP 3-drum, WT, complete with gas burners, feedwater controls, breeching and 5' 6" x 125' ¼" welded plate stack.

CONDITION: Excellent

PRICE $10,500.00

SUBJECT TO PRIOR SALE

SOUTHERN MINERALS CORPORATION
P. O. Box 718
Corpus Christi, Texas

G. M. C. DIESEL ENGINES

New and Rebuilt 4-71 and 6-71, for

Power Units	Truck Engines	Graymarines
Single or Twin		With 1½ to 1, 2 to 1 or 3 to 1 reduction

Also complete stock of New and Used Surplus G.M.C. Diesel Parts

P. & G. SUPPLY CO.
Interstate and Albina **PORTLAND, OREGON** **Phone TUxedo 5197**

STANDARD BLACK PIPE

Good Used Condition

2"	Standard—Approximately	55,000 feet
3"	Standard—Approximately	15,000 feet
4"	Standard—Approximately	10,000 feet
6"	Standard—Approximately	7,000 feet
8"	Standard—Approximately	10,000 feet
10"	Standard—Approximately	2,500 feet
12"	Standard—Approximately	2,500 feet

Single Random Lengths
Immediate Delivery
Subject to Prior Sale

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (C-641)
Kansas City 18, Kansas
THatcher 8243

LIQUIDATION SPECIAL!

COMPLETE WATER TREATING UNIT
Hot Lime System
3200 G.P.H. Make-Up 18000 G.P.H. Condensate
Manufactured by Permutit

Consists of:

Chemical feed tank 5' x 3' 8" w/motor driven agitator
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Hot lime soda filter 5'6" x 7'4", 4300 G.P.H. capacity.
Wash pump for above.
Hot lime soda deaerator and softener 9' x 26' on 9' stand.
All controls, valves, fittings, etc., necessary for operation.

FIRST CLASS CONDITION IN EVERY RESPECT

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P. O. BOX 667
COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

XUM

EQUIPMENT FOR SALE

FOR SALE: 300 Amp Westinghouse welding machine powered by 6-BK Waukesha engine. Completely overhauled. Less than 60% of new price. Melton Supply Company. Box 1360, Seminole, Oklahoma

FOR SALE: 7000' 4½" o.d. 14 lb., range 2, seamless. All new threads and couplings. Price $1.50 f.o.b. Coffeyville, Kans. M. J. Regan, phones 448 and 3892.

FOR SALE: One Type-L Star Spudder with shear poles, P.A. 100 gas-gasoline motor, new belt. E. A. Kelly, Box 861, Oklahoma City, Okla. Phone 5-6407.

FOR SALE: 200 Reed shrunk, 4½" drill pipe joints. Suitable for further use. M. J. Regan, Coffeyville, Kans.

PIPE FOR SALE: We are finishing taking up 10,000 feet of 6" O.D., 10.22 lb. splendid transmission line, straight, beveled, 40' lengths and ready to lay. Also, 10,000 feet of heavy, good threads, long collars 2" tubing. The Allen Gas Corp., Paola, Kansas.

FOR SALE: Diesel powered, skid mounted, single stand derrick, 3,000' drill rig drill pipe, drill collars, Halliburton Line, plenty tools, 500' new 5½ J-55 15x17 lbs. casing, three trucks and trailers, also 70 barrel water tank. Cash only $66,000.00. Box D-734, The Oil and Gas Journal, Tulsa, Oklahoma

9500 FEET electric conducting cable, new, never used, prestressed and preformed, 48,000 lbs. breaking strength. 2507 Mercantile Bank Building, Dallas, Texas.

BOILERS FOR SALE: 18 Code Oil Field Boilers, 50 to 87 H.P., 100 to 200 Lbs. W.P., Operated Under Hartford into 1948, Not Fired Since. Located on Leases Vicinity Pampa, Texas. Offered Subject to Prior Sale. $500.00 to $700 each, as is, where is Contact Max Harbison, Kewanee Oil Company, Pampa, Texas.

TANKS FOR SALE: 3—80,000 bbl. all steel welded, 2—80,000 bbl. all steel riveted. 4—55,000 bbl. all steel welded, 1—55,000 bbl all steel riveted. Will cut down or sell as is where is. Phone 3-6141, W. C. Berry, Tulsa, Oklahoma.

BARGAIN FOR QUICK SALE

Large Steam Rig Complete Ready to go. 14x14 Engine, 18" & 20" Pumps, 10,000' 4½ Drill Pipe, 136' Drk All 300 Ton Equipment. Everything Good Condition. McDaniel & Beecherl Drlg. Co., Phone: Randolph 6010, Dallas, Texas, or Phone 3651, Odessa, Texas.

Several Army Surplus 4½" x 6" Gaso Duplex 1860 Pumps — two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN: W. H. Orr
Phones: 132—Rockdale, Texas
A-88064—Houston, Texas

EQUIPMENT WANTED

WANTED: USED 4½" DRILL PIPE
Box D-606, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED TO BUY: Bucyrus-Erie 36-L or 28-L. Must be in good condition. Raymond Commons, 501 J Street, Rupert, Idaho, Phone 193-R.

HELP WANTED

WANTED: Engineer familiar with Gas-fired Unit Heater design. Box D-701, The Oil and Gas Journal, Tulsa, Oklahoma.

Corrosion Engineer

New large oil pipe line company requires two corrosion engineers immediately to set up and maintain corrosion protection on 1000 mile oil pipe line. Two years' experience minimum required. Should be familiar with all phases of field and office work. Include full details of professional experience in first letter. Box D-741, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

PETROLEUM Engineer or Geologist with experience in evaluation and subsurface studies in Gulf Coast wanted by sound independent. Age 30-45. In application state salary expected and enclose college transcript. Box D-631, The Oil and Gas Journal Tulsa, Oklahoma.

MIDWEST natural gas transmission and distribution company has opening for operating executive. Furnish full information as to qualifications. Box D-729, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING AND COMPLETION SUPERINTENDENT for Latin American operations. Salary $15,000 to $18,000 plus. Extensive experience required and knowledge of Spanish preferred. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

DRAFTSMEN

Positions open for draftsmen experienced in general refinery drafting, pressure vessel design, piping layout, etc. Give education, experience, and salary expected.

KOCH ENGINEERING CO., INC.
335 West Lewis Street
Wichita, Kansas

ESTIMATOR

Experienced ENGINEER familiar with Oil Refinery design and capable of estimating process equipment from flow diagrams.

Give full information, experience record and salary expected.

ARTHUR G. McKEE & CO.
2300 CHESTER AVE.
CLEVELAND 1, OHIO

ENGINEERS

Major oil company operating in the Middle East requires graduate engineers in the following classifications:

SENIOR PROCESS ENGINEER
GEOPHYSICS ENGINEER
GEOLOGIST (SEISMOGRAPH)
ASST. GEOLOGIST (SUBSURFACE)
ASST. CHEMICAL ENGINEERS
ASST. CHEMIST (ANALYTICAL)
GEOLOGICAL DRAFTSMAN

Also we have positions for experienced and inexperienced civil, mechanical, electrical, construction and highway engineers.

If interested, write giving full outline of personal and employment history.

Box D-728
The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

FOR IMMEDIATE employment. Trained experienced Observers, Surveyors and computers. For seismic exploration crews. Age limit 42 years. Domestic and foreign work. Submit experience record in first letter. All replies confidential. Box D-730, The Oil and Gas Journal, Tulsa, Okla.

WANTED by active Independent—Water Flood Engineer. Must be technically qualified to plan and conduct a flood and supervise same in field. An excellent opportunity for right person. Box D-743, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MAN, with experience, for oil company, in Shreveport, Louisiana, area, who can handle executive responsibilities. Replies confidential. Box D-740, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced Gasoline Plant Superintendent. Rocky Mountains. Salary open. Replies confidential. Box D-747, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Graduate Petroleum or Mechanical Engineers, or men with several years of experience in drilling or petroleum production work for employment with Oil Well Service Company. Reply to Box D-733, in care of The Oil and Gas Journal, Tulsa, Oklahoma, giving education, work experience, age, military service record, marital status and a recent photograph.

WANTED: Experienced Project Engineer for independent oil company now constructing Fluid Cat Cracker. Applicant must later qualify for position of Chief Engineer to supervise refinery inspection, maintenance, and miscellaneous construction work. Please give complete information, age, military status, education, experience, and salary expected. Box D-749, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN and Domestic Oil Employment Directory covering the oil industry, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla.

SALES ENGINEERS
OPERATIONS SUPERVISORS
PERFORATOR OPERATORS

Only Experienced Men Need Apply

WRITE ONLY

WELEX JET SERVICES, INC.
3000 Hemphill Street, Fort Worth 8, Tex.

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico Personal interview by appointment is desired. Makin Drilling Company, Box No 131. Ph. No. 131, Hobbs, New Mexico.

DRILLING Contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager Personal interview desired. Twenty years experience in all phases of the oil industry Address replies to Box D-644, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEER: Experienced Houston area will represent your process plant equipment. Box D-723, The Oil and Gas Journal, Tulsa, Oklahoma.

IF you are a service company serving the oil industry and need an experienced salesman, contact W. A. Anderson, 5015 Cowper, Dallas 5, Texas. Excellent references furnished upon request. Have spent a number of years selling oil field supplies, handling advertising accounts, and establishing material outlets. Prefer commission contract with established oil firm.

REGISTERED MECHANICAL ENGINEER desires to invest in and assume engineering position with pressure vessel and/or tank fabricator for Tulsa area. Box D-739 The Oil and Gas Journal, Tulsa, Oklahoma

GEOLOGIST with varied experience in several states including several districts in Texas. Now in Permian Basin. Mature, of good health, and free of military commitments. Box D-738, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST: 34 yrs., married, with 12 yrs. of extensive major and independent company experience in all phases of petroleum exploration and development in Texas, Louisiana, and New Mexico. Prefer connection with active independent. Excellent references. Box D-715, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED in Oil Refinery in capacity Boiler Fireman, absorption plant operator, skimming plant operator, compressor station operator. Box D-745, The Oil and Gas Journal, Tulsa, Oklahoma.

MAJOR COMPANY GEOLOGIST, graduate training, extensive experience, wants position Mid-Continent or Rockies with major company or independent. Box D-744, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT Division Landman with Major Oil Company desires change, would consider District Land job with large independent or Major Company. Box D-742 The Oil and Gas Journal, Tulsa, Oklahoma

GEOLOGIST, 12 years experience, desires connection with independent company. Experienced in subsurface work, production geology, seismic and core drill operations. Prefer southern location. Box D-748, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, age 36, married, over five years experience in subsurface work with major companies in Mid-Continent and Gulf Coast, desires change. Box D-746, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER of small producing company liquidated because of death of principal stockholders seeks employment with owners or prospective owners of oil production in Oklahoma, Texas, New Mexico. Nineteen years experience in leasing, drilling, producing. Have good connections for farmouts and drilling blocks. Can furnish office and automobile. Boxholder 11054, Fort Worth, Texas.

SERVICES

IF the banks won't go, we will loan on diamonds and jewelry. Insured, Bonded, Dependable. Johnny Clingingsmith, 303 Clingingsmith Building, 1707½ Main, Dallas, Texas.

REAL ESTATE

FOR SALE in Odessa, Texas, Large Commercial Brick Building, especially suitable for Oil Field Supply house. Excellent location. Contact Ray Britton Agency, 302 West 5th St., Odessa, Texas.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1905. Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing. Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa. 3, Oklahoma.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorney. Suite 418 815-15th Street, N.W., Washington 5, D. C.

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CHEMICAL & ENGINEERING CO., INC.
Box 426, Union, N. J. UNionville 2-7260

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

MONTANA ROYALTIES
Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225, Great Falls, Montana

LEASE AND DRILLING BLOCKS

SCURRY COUNTY: Snyder lot 50 x 140 in N.W.¼ of section 155. Want drilling, override and bonus. V. A. Epps, Pioneer Hotel, Tucson, Arizona.

NEED capital to develop Creek County, Oklahoma, lease offset by Red Fork sand production. P.O. Box 958, Telephone 875, Bristow, Oklahoma.

FOR SALE—⅛ working interest recently developed Berea production, Ashland County, Ohio. 13 pumping wells, 40 bbl. per day. 145 acres, many good locations, three wells under contract. For information, write or wire F. G. Browne, Marion Building, Marion, Ohio.

FOR SALE: Partly developed 160 acre water flood production, good equipment. F. W. Black, Paola, Kansas.

TEXAS, OKLAHOMA, and Canadian oil and gas lease acreage offered for drilling or sale, with subsurface geology or geophysics. These include a 30,000 acre block in Texas, 1000 acres in Oklahoma and 6000 acres in Canada. Montana and Wyoming blocks under consideration. Box D-750, The Oil and Gas Journal, Tulsa, Oklahoma.

U. S. LANDS in Colorado can be filed for Government oil lease in developing area. Good opportunity. Small Expense. Write S. W. Pressey, Pueblo, Colorado.

1280 ACRES choice leases around major company block near proposed location in Beaver County, Oklahoma, priced right. Box 2011, Odessa, Texas.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

ALBERTA
Leases and Royalties

ALBERTA LEASEHOLDS
131-Ninth Avenue West
Calgary, Alberta, Canada

BUSINESS OPPORTUNITIES

FOR SALE: Drilling and well servicing business, 4 rigs on locations in Rocky Mountain Area. Yearly gross $400,000.00. Ill health reason for selling. Box D-751, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES AND RENTALS

LUBBOCK OFFICE

Oil operator has extra airconditioned office downtown Lubbock block west Lubbock Hotel in 2-story modern office building to rent by month to geologist, accountant, oil service or supply company. Write:

P.O. BOX 1032, Lubbock, Texas

WANTED

MANUFACTURERS' AGENT

Manufacturers' agent covering Gulf Coast oil fields, refineries and process plants, seeks additional line. Maintains office, warehouse and shop in Houston and eight sales engineers in the field.

Box D-713, The Oil and Gas Journal, Tulsa, Oklahoma

EQUIPMENT MEN

(Continued from page 139)

City, El Paso to New Orleans, A. A. Kruse, Jr., Dallas; Pacific division, Los Angeles to Seattle, Denny Gordon, San Francisco.

The company's representatives in the division areas will report directly to the division sales manager.

Fulleman Joins Cooper-Bessemer Engineer Staff

JOHN FULLEMAN

Cooper - Bessemer Corp. has revealed that for several months John Fulleman, recognized authority on engine supercharging and centrifugal - compressor design, has been at work with the company's engineering staff coordinating a broad engine development now under way at its Mt. Vernon, Ohio, headquarters plant.

On certain types of pumping service for gas-transmission lines, R. L. Boyer explained, "centrifugal compressors in some places are being considered for complementing reciprocating-type compressors similar to those manufactured by our company. As builders of the engines that drive these centrifugal compressors, it is imperative, therefore, that our engineering department have on its staff an outstanding authority with broad experience on the mechanics as well as the economies of centrifugal compressor operation."

Fulleman received his technical engineering background at the Federal Institute of Technology in Zurich, Switzerland. During the last war he was the field representative for Buchi, well-known Swiss engineering firm, adapting Swiss - designed exhaust-driven superchargers to American-built engines.

Herron Will Represent Kennedy in Texas

Kennedy Valve Manufacturing Co. has announced the appointment of Shelby Herron of Houston as sales representative for Texas.

Before joining the Kennedy organization, Herron was in sales engineering work in the oil-field supply business. He will handle sales for the complete Kennedy line of bronze and iron-body valves, water-works valves and fire hydrants, malleable iron, bronze, and cast-iron fittings.

XUM

ADVERTISERS IN THIS ISSUE

Abegg & Reinhold Co. 108
Aerofin Corporation 12
Allen's Foundry & Machine Works 126
American Iron & Machine Works Co. .. 94
American Optical Company 3
Armco Drainage & Metal Products, Inc. 41
Armstrong Machine Works 98

Baird Mfg. Co. 123
Baker Oil Tools, Inc. 122, 177
Barret, Inc., William M. 129
Barrett Division of Allied Chemical & Dye Corp. 113
Bethlehem Steel Co. 8
Bettis Corporation 128
Black, Sivalls & Bryson, Inc. 92, 98
Blair, Rollins & Company 131
Boyd Co., Clarence L. 102
Broderick & Pascom Rope Co. Back Cover
Bucyrus-Erie Co. 11

Cable & Stine 126
Charlie's Machine Works 129
Chicago & Southern Air Lines 124
Chicago Bridge & Iron Company ..... Inside Back Cover
Clark Brothers Co., Inc. 5
Classified Advertising 140, 141, 142, 143
Collin Street Bakery 19
Crose Manufacturing Co., Inc., M. J. 104

Darling Valve and Mfg. Co. 7
Dean Brothers Pumps, Inc. 170
Delta Engineering Sales Co. 111
Diamond Chain Company, Inc. 116
Dow Chemical Co., The 6
Dowell Incorporated 74
Drilling & Service, Inc. 130
du Pont 9, 106

Fairbanks, Morse & Co. 2
Fuller Company 17

Garlock Packing Company, The 10
General American Transportation Corporation 78, 79
Gott Mfg. Co., H. P. 170
Grancell, I. H. 108
Gunite Concrete & Construction Co. .. 112

Harvey & Co., Ltd., G. A. 96
Hinderliter Tool Co., Div., H. K. Porter Company, Inc. 107
Huey & Co., S. E. 100
Hughes Tool Co. ..... Front Cover

Inferno Co., The 112, 124, 126, 170
International Harvester Co. 73
Jones & Laughlin Supply Co. 13

Keplinger and Wanenmacher 119
Koch Engineering Company, Inc., The .. 110

Lane-Wells Company 26
Larkin Packer Company, Inc. 118
Lloyd Metal Foundry Co. 99

Mason-Neilan Regulator Co. 20, 21
Mayo Hotel, The 121
McCord Corporation 100
Mission Mfg. Company 42
Monsanto Chemical Company 115

National Airoil Burner Co., The 112
National Supply Co., The 22
National Transit Pump & Machine Co. 102
Norris Brothers, Inc. 128

Oakite Products, Inc. 18
Oil and Gas Journal, The 131, 136
Oil Center Tool Co. 76
Oklahoma Contracting Corporation 101

Pan American World Airways 121
Penberthy Injector Co. 108, 112
Perrault Brothers 100
Petroleum Electric Power Association 16

Quaker Rubber Corporation, Division of H. K. Porter Company, Inc. 87

Reed Roller Bit Company 90
Republic Steel Corporation 109
Ryerson & Son, Inc., Joseph T. 123
Schutte and Koerting Company 4

Standard Pressed Steel Co. 112
Standco Brake Lining Co. 108
Steel Forgings, Inc. 102
Thornhill-Craver Co. 85
Trans-Texas Airways 127
Trojan Construction Co., Inc. 104
Tulsa Paper Company 129

Universal Oil Products Co. 82, 83

Vick & Sons, E. W. 108
Voss Co., Inc., J. H. H. 99

Wales Trucking Co. 100
Wallace & Tiernan Products, Inc. 119
Walworth Co. 1
Wedgeplug Valve Co., Inc. 100
Well Equipment Mfg. Corp. 103
Wellite 121, 126, 129
Westinghouse Electric Corp. 14, 15
Williamson, Inc., T. D. 105
Wilson Manufacturing Co., Inc. 88
Wyatt Metal & Boiler Works ..... Inside Front Cover

Yale Machine Works 104

Permian Basin

(Continued from page 131)

T & R Drilling Co. 1 Stanolind-Univ., 11-39-Univ. Lands, dry, TD 875 ft.

Dawson County: Seaboard Oil Co. and Southern Minerals Corp. 1 W. O. Jones, 36-35-5N-T&P, 5 mi. SE Lamesa, dry, TD 9,154 ft., elev. 2,942 ft., reef 8,954 ft. by samples.

Garza County: Aurora Gas Co. 1 Swenson, 7-7-H&GN, dry, TD 7,525 ft., elev. 2,353 ft., Wolfcamp 5,020 ft.

Cities Service Oil Co. 1 Stocker, 71-5-GH&H, 3 mi. NE Post, dry, TD 8,450 ft., elev. 2,474 ft., Strawn 7,710 ft., Mississippian 8,100 ft., Ellenburger 8,325 ft., by samples.

R. J. O'Brien, Jr. 1 Long, Sec. 1, Isaac Scott Sur., A-454, dry, TD 3,605 ft.

Howard County: Burdell Oil Co. 1 J. Hodnutt, 31-25-H&TC, dry, TD 7,568 ft.

Kent County: J. B. Stoddard 1 C. H. Byrd, 424-D-H&TC, dry. TD 6,896 ft., elev. 1,963 ft., Valera 2,078 ft., Dotham 3,580 ft., Home Creek 4,850 ft., Mississippian 6,704 ft., Ellenburger 6,855 ft.

Pecos County: C. W. Brown 1 State National Bank, 9-140-T&St.L., dry, TD 1,625 ft., San Andres 1,620 ft.

Carl Engle 1 Westerman, 8-604-GC&SF, 3½ mi. S Bakersfield, dry, TD 2,243 ft.

Reeves County: Gulf Oil Corp. 1 G. C. Fraser "A," 19-50-T8-T&P, SE corner of county, dry. TD 5,300 ft.

Runnels County: George Baumgart & Co. 1 Mrs. Lena Clayton, A. A. Millican Sur. 260, 10 mi. E Ballinger, dry, TD 4,016 ft., elev. 1,788 ft., Ellenburger 3,988 ft.

Richard King, Jr. and B. F. Phillips 1 W. P. King, J. San Miguel Sur. 72, dry, TD 4,171 ft., Caddo 4,118 ft.

Haynes B. Ownby Drilling Co. 1 W. H. Cole, George Ross Sur. 543, 6 mi. NE Winters, dry, TD 4,290 ft., elev. 1,840 ft., Capps 3,680 ft., Fry 3,718 ft., Gardner 4,084 ft, Gravburg 4,205 ft.

Ray & Woolf 1 O. O. McWilliams, G. Hall Sur. 324, 3 mi. E Crews, dry, TD 4,000 ft., elev. 2,003 ft., Dotham 1,562 ft., Home Creek 2,725 ft., Palo Pinto 3,206 ft., upper Capps 3,510 ft., lower Capps 3,587 ft.

Scurry County: O. W. Killam 1 Geo. Weldon Johnson, 150-2-H&TC, 8 mi. NE Snyder, dry, TD 7,696 ft., elev. 2,292 ft., Ellenburger 7,582 ft.

Sterling County: Ray A. Albaugh 1 J. S. Cole, 8 mi. SE Howard-Glasscock field, section not reported, dry, TD 4,225 ft.

Tom Green County: Aurora Gasoline Co. 1 J. N. Brannon, L. Schuchardt Sur. 160, 3 mi. E San Angelo, dry, TD 6,225 ft., elev. 1,841 ft., Strawn 5,280 ft., Ellenburger 5,950 ft. (?).

SOUTHEAST NEW MEXICO

HOBBS.—Magnolia Petroleum Co. 1-Z State, 36-7s-29e, northwest outpost to Lightcap field of Chaves County, was coring ahead at 8,584 ft. following a drill-stem test at 8,539-59 ft. which recovered mud and sulfur water.

Amerada Petroleum Corp. 1-BTH State, 26-12s-33e, east of Hightower field, was dry at 10,189 ft. Last drill-stem test, with packer at 10,164 ft., recovered 60 ft. of mud having a light show of gas, 210 ft. of mud and 240 ft. of sulfur water.

Amerada's 1-BTI State, 2-12s-33e, developed a flow averaging 46.7 bbl. of 47°-gravity oil on a 4-hour drill-stem test from 9,050-75 ft. Gas-oil ratio was 1,166 cu. ft. The well had additional gas shows on a 4-hour test at 9,320-95 ft. Gas surfaced in 27 minutes, rated at 93,600 cu. ft. daily, and recovery was mud cut with gas.

Stanolind Oil & Gas Co. staked a southwest offset to McAlester Fuel Co. 1-A Brownfield, recent Devonian discovery. The new well is to be the 1 Lois Wingerd in 24-12s-38e, 10 miles east of Tatum. Contract depth was 12,000 ft.

Location was reported this week for a 7,000-ft. wildcat to be drilled in north-central Chaves County, by John Sanders as the 1 Sanders, in 25-5s-24e. Operators were to start as soon as the location had been cleared and rotary moved in. The new test is about 25 miles from nearest production.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Eddy County: Emperor Oil Co. 16 Puckett, 24-17s-31e, dry, TD 5,323 ft., elev. 3,928 ft., Grayburg 3,270 ft., San Andres 3,655 ft., Glorietta 5,180 ft.

CALENDAR OF EVENTS

November

Mid-Continent Oil and Gas Association, Louisiana-Arkansas Division, annual meeting, Roosevelt Hotel, New Orleans, November 2-3.

New Mexico Geological Society, first annual conference, San Juan Basin; headquarters, Albuquerque; November 3-5.

Society of Automotive Engineers, Fuels and Lubricants meeting, Mayo Hotel, Tulsa, November 9-10.

California Natural Gasoline Association, Silver Anniversary, Los Angeles, November 9-10.

American Petroleum Institute, annual meeting, Biltmore and Ambassador Hotels, Los Angeles, November 13-16.

American Society of Mechanical Engineers, annual meeting, Grand Central Palace, New York, November 27-December 1.

Southwestern Geophysical and Geological Conference, Hotel Texas, Fort Worth, November 30-December 2.

December

American Institute of Mining and Metallurgical Engineers, annual joint meeting, Texas sections, Texas Technological College, Lubbock, Tex., December 1-2.

American Institute of Chemical Engineers, annual meeting, Columbus, Ohio, December 3-6.

Interstate Oil Compact Commission, winter meeting, Shamrock Hotel, Houston, December 11-13.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month. Ye Olde College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month. Jonathan Club.

New York Nomads, dinner meeting November 6, Louis Sherry's; annual Christmas dance, December 9, Hotel Pierre.

TABLE OF CONTENTS ON PAGE 25

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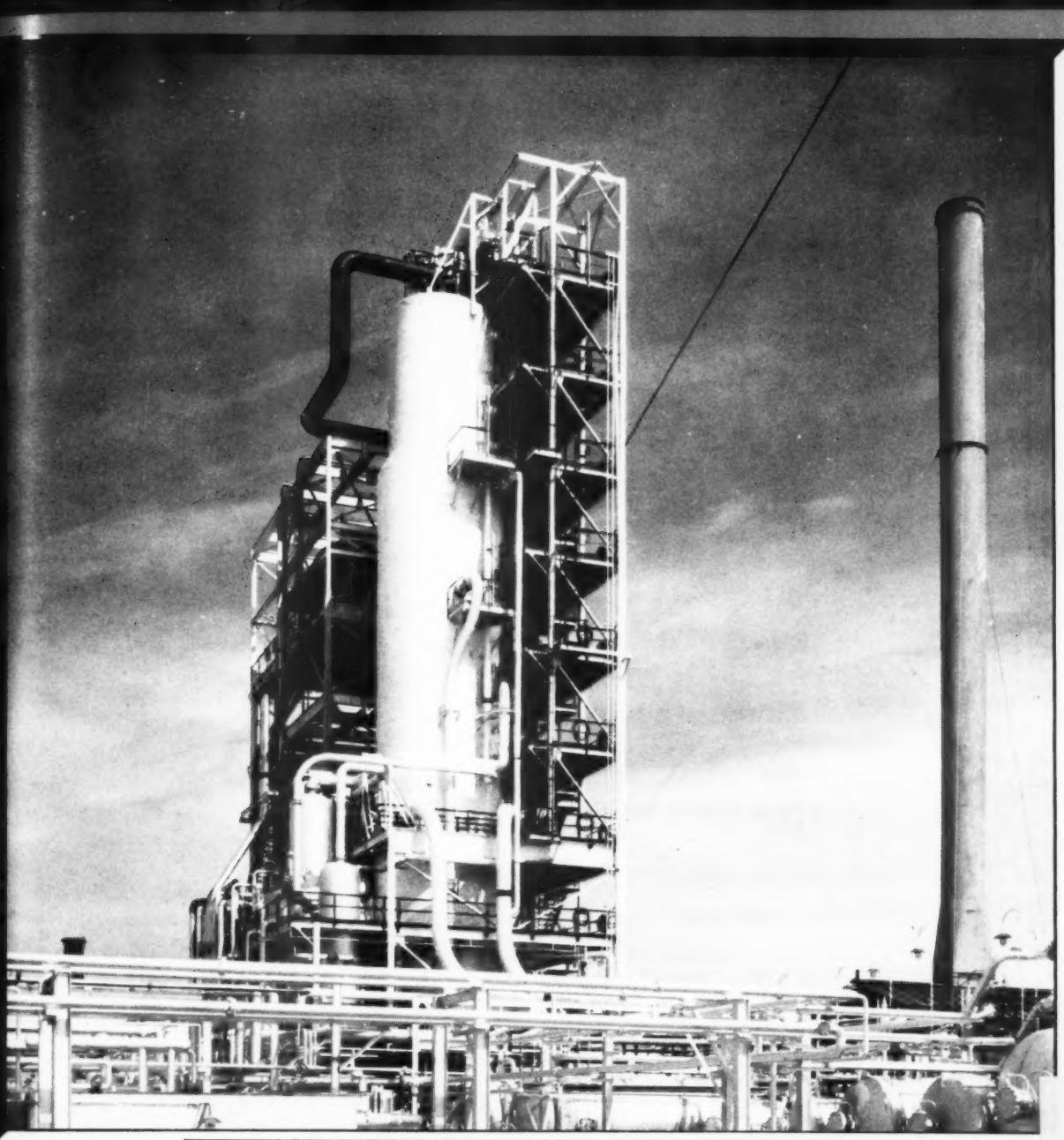

Refinery Tower at Amuay Bay

This atmospheric fractionating tower is located at the Creole Petroleum Company's refinery at Amuay Bay, Venezuela. The Foster Wheeler Corporation designed it and we built it. Refinery towers are one of many types of steel plate structures we build to meet the exacting requirements of the petroleum industry. Others include cone-roof storage tanks and pressure storage tanks. Write our nearest office for quotations when you need steel plate equipment of any type.

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Detroit, 26.....1514 Lafayette Bldg.
Havana.....402 Abreu Bldg.
Houston, 2.....2119 National Standard Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615—1700 Walnut Street Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 4.....1554—200 Bush St.
Seattle, 1.....1325 Henry Bldg.
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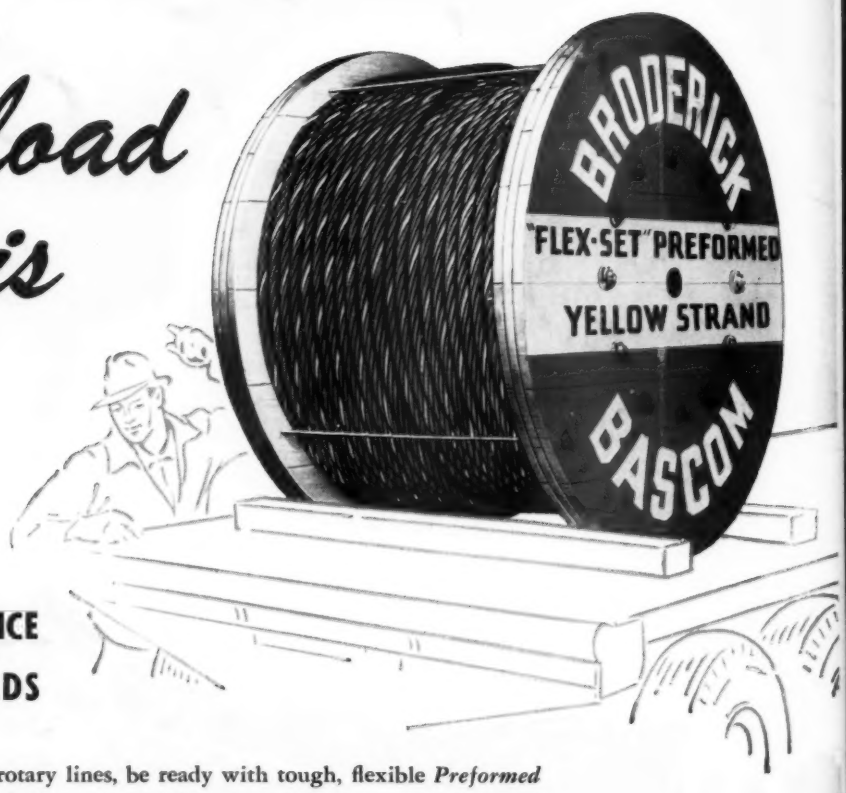

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